This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

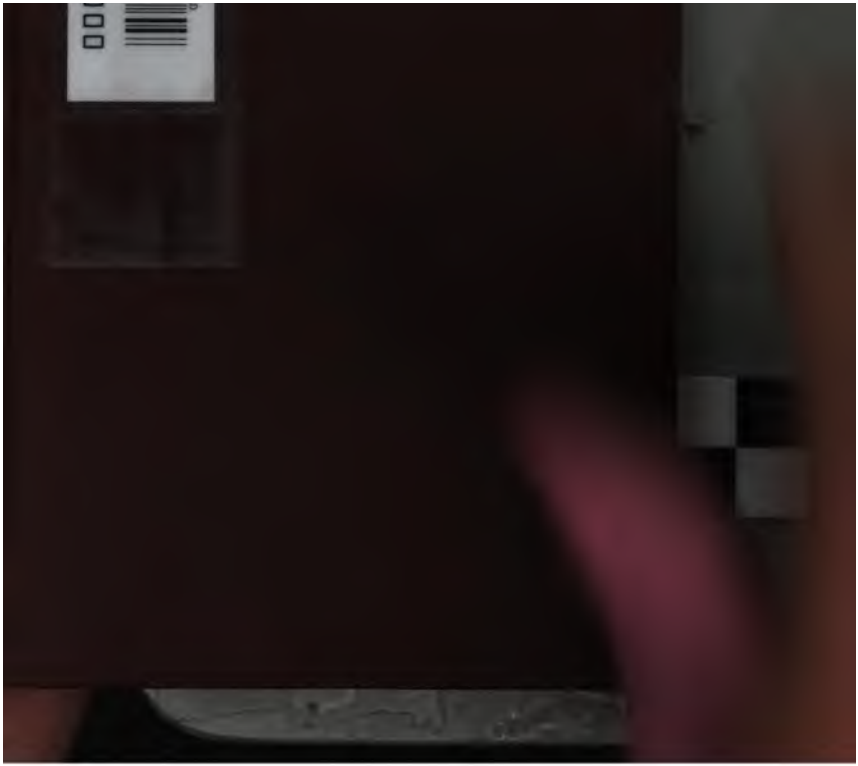
+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`



LANE

MEDICAL LIBRARY

Gift
Dr.Jens P.Jensen

MEDICAL 

LIBRARY

Gift
Dr.Jens P.Jensen

ELEMENTARY BANDAGING

AND

SURGICAL DRESSING,

WITH DIRECTIONS CONCERNING
THE IMMEDIATE TREATMENT OF CASES
OF EMERGENCY.

FOR THE USE OF DRESSERS AND NURSES.

BY

WALTER PYE, F.R.C.S.,

Late Surgeon to St. Mary's Hospital.

REVISED AND IN PART RE-WRITTEN BY

G. BELLINGHAM SMITH, F.R.C.S.,

Surgical Registrar, Guy's Hospital.

SEVENTH EDITION.

Philadelphia:

W. B. SAUNDERS, 925, WALNUT STREET.

1897.

ELEMENTARY BANDAGING

AND

SURGICAL DRESSING,

WITH DIRECTIONS CONCERNING
THE IMMEDIATE TREATMENT OF CASES
OF EMERGENCY.

FOR THE USE OF DRESSERS AND NURSES.

BY

WALTER PYE, F.R.C.S.,

Late Surgeon to St. Mary's Hospital.

REVISED AND IN PART RE-WRITTEN BY

G. BELLINGHAM SMITH, F.R.C.S.,

Surgical Registrar, Guy's Hospital.

SEVENTH EDITION.

Philadelphia:

W. B. SAUNDERS, 925, WALNUT STREET.

1897.

LANE LIBRARY

ELEMENTARY BANDAGING

AND

SURGICAL DRESSING,

WITH DIRECTIONS CONCERNING
THE IMMEDIATE TREATMENT OF CASES
OF EMERGENCY.

FOR THE USE OF DRESSERS AND NURSES.

BY

WALTER PYE, F.R.C.S.,

Late Surgeon to St. Mary's Hospital.

REVISED AND IN PART RE-WRITTEN BY

G. BELLINGHAM SMITH, F.R.C.S.,

Surgical Registrar, Guy's Hospital.

SEVENTH EDITION.

Philadelphia:

W. B. SAUNDERS, 925, WALNUT STREET.

1897.

PREFACE TO FIRST EDITION.

THIS little book is chiefly a re-issue of those portions of "Surgical Handicraft" which deal with bandaging, splinting, etc., and of those which treat of the management in the first instance of cases of emergency, only such new matter being added as is required to give some sort of continuity to the extracts.

While I am anxious that the book should not pretend to be anything but a reprint, I yet hope that within its own limits it is fairly complete, and that it will prove to be useful to students when they begin their work in the wards and casualty rooms, and useful also to surgical nurses and probationers.

WALTER PYE.

4, SACKVILLE STREET,
March 1886.

CONTENTS.

SECTION I.

Of Apparatus for Restraint and Support. (Bandages, Splints, Etc.)

SECTION II.

Of the Simpler Ways of Dressing Wounds, Burns and Scalds.

SECTION III.

The Treatment in the First Instance of Accidents and Emergencies.

LIST OF ILLUSTRATIONS.

SECTION I.

SECTION II.

SECTION III.

ELEMENTARY BANDAGING.

SECTION I.

OF APPARATUS FOR RESTRAINT AND SUPPORT (BANDAGES, SPLINTS, ETC.).

CHAPTER I.

OF BANDAGES AND KNOTS.

THE first part of this section deals with the several kinds of bandages, and the second part with splints in their varieties and modes of application.

Bandages may be roughly divided into "triangulars," or "scarfs," "rollers," and bandages of special form such as the "T," the "H," or the "many tailed." The material of which they are made is usually grey shirting, *i.e.*, unbleached calico, but roller bandages are often made of flannel, or of some woven material, for greater elasticity or strength; or of muslin, for holding plaster of Paris, etc. Old household linen makes very good bandage material, and short of being rotten, the older the stuff, the more comfortable will it be.

The choice of the form of bandage, and of the material, will depend on consideration of such points as these:—

The amount of pressure or support required. A simple triangular bandage may be used with advantage in cases of emergency, or for retaining in position such applications as poultices and compresses, or dressings where a uniform support is of no moment. In all cases, however, in which firm, even pressure is required, the roller bandage should, when possible, be made use of. It will be found indispensable in the control of bleeding, and for providing the uniform support required

in the fixation of dressings after the majority of operations.

The effect of the bandage on the circulation. Great care should be taken that the bandage when applied does not constrict the limb in such a way as to interfere with the circulation of the part. This is the more necessary when, as the result of inflammation or injury, swelling is rapidly taking place. The condition of the limb on the far side of the bandage should in these cases be carefully watched, and any indication of failure in the circulation should be met by loosening the bandage.

The choice of the material to be used will depend upon the nature of the lesion. For dressing wounds the best form is the so called water-dressing bandage, which is more elastic, cooler, and allows of freer evaporation of discharges than the calico bandages, which are in common use in hospitals and elsewhere. Where absolute immobility of a part is desired, muslin bandages stiffened with starch or plaster are made use of.

The form of bandage will depend mainly upon the situation. In the course of a limb the spiral and reversed spiral will be made use of, whilst opposite joints figure-of-eight and spica bandages will be found necessary.

The Triangular Bandage.

This bandage is the half of a square having a side of 40 inches, and is usually made of unbleached calico; it has for some years been used in military surgery, but in the surgical work of civil hospitals it is still much neglected. It is mainly applicable to out-patient surgery, or to the dressing of accidental injuries, and can

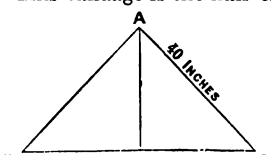


Fig. 1.—The Triangular Bandage.

be used for all dressings where a smooth, even, and regular pressure is not required.

The first and most obvious use of this bandage is to simply tie it round where it may be wanted, with a reef knot, it having been previously folded up into a cravat. In a case of venæsection the arrest of the venous circulation above the incision may be effected thus, or improvised splints may be attached, or a leg swung from a cradle, etc

The *Sling* is another very useful bandage, and very quickly put on; indeed, of all the applications of the triangle it is the most frequently required. Although its application may be shown in a few seconds, a written description of it, as with other bandages and knots, is more complicated.

FIG. 2.—*The Sling and Head Bandages.*

Let the right angled corner be called A, and the upper and lower acute angled ones B and C respectively.* Standing in front of the patient, corner A should be placed in the axillary line on the affected side, midway between the axilla and the ilium, B should reach up to, and hang over, the opposite shoulder.

The line B to C will then hang diagonally across the body, and between it and the arm to be slung. The arm should be placed in the required position, and C brought up

* *These letters apply to the rest of the triangular bandages where they may appear on the figures, in the same way.*

over the shoulder on the affected side and tied with B in a bow behind, or to one side of the neck. The elbow should then be kept in position by pinning A round it as shown in the figure. (Fig. 2.)

In slinging the forearm, the sling should be made just short enough to slightly elevate the shoulder, or the patient will not trust all the weight of the limb to it. The hand should be a little higher than the elbow. Sometimes, as in fractures of the humerus, the weight of the forearm is used as an extension, while the hand and wrist alone are slung by the bandage folded up into a cravat, three or four inches wide, and tied behind the neck. In this case the position of the ends of the sling should be reversed, the anterior going over the shoulder of the unaffected side.

The Head bandage (Fig. 2) differs hardly at all from the picturesque head-dress of the Italians, which may be seen worn by the women organ-grinders. It is very useful as a cap to retain dressings in their place on the scalp, but it is not fitted for compression. As a cap it is infinitely superior to the "capeline" roller bandage, which is hot and difficult to apply.

Standing behind the patient, who should be sitting down, the middle of the long side of the bandage, opposite A, is placed along the forehead above the eyes, the triangle covering the head, and corner A hanging down behind; the rest of the long side is then brought round the sides of the head, taking care that the hands, as they apply the bandage, are kept low, so as to bring the lower edge well below the occiput. The tails B and C should be crossed, *not knotted*, over A, below the occipital protuberance, and brought forward again round the head to the forehead, where they must be tied. A is then turned *up and pinned* to the surface of the triangle on *the head.*

The only points to be attended to are, the keep *the hands low* while working from before backwa

and to cross the ends well below the occiput. If this is done the cap cannot slip off, and if not, no tightness will make it firm.

The Chest or Back bandage (Figs. 3 and 4) is again very useful for retaining such applications as poultices to the trunk, and its employment saves much laborious and wasteful use of broad roller bandages which do not answer the purpose nearly as well.

FIG. 3.—*The Chest Bandage.*

The method is the same whether the bandage be applied in front or behind, so that one description will suffice for both back and front, if the terms are reversed.

Standing in front of the patient the right-angled corner A is placed over one shoulder, and the long side *adjusted* round the waist. Then the ends B and *C are tied* behind, on the same side as the shoulder *over which A* is hanging. Thus, one of the ends will

be left long at the waist behind, and this should be taken up and fastened to A, with a knot or a safety-pin, the junction being about the upper border of the

FIG. 4.—*The Back Bandage.*

scapula, and therefore out of the way of pressure when the patient lies down.

The Shoulder is most securely bandaged with two triangles as in Fig. 5. One, folded into a scarf, is fastened diagonally across the body, over the injured shoulder, and under the opposite arm-pit. The corner A of the other is then pinned to it so that the centre of this bandage covers the point of the shoulder, and B and C are crossed over and tied round the arm below the axilla.

The Shoulder may also have a dressing retained upon it by using one triangle only, on the same plan

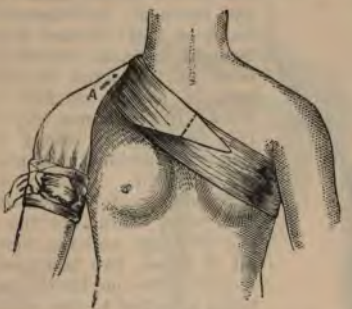


FIG. 5.
The Shoulder Bandage, with Two Triangles.

as for the knee (Fig. 6), namely, by placing the bandage, so that the point of the shoulder is covered by its centre, with A pointing towards the ear, and the long side lying horizontally across the arm. B and C are brought round and crossed behind the arm below the arm-pit, and then brought up and tied above the shoulder over A, which may be turned down and pinned. In these bandages there is no pressure upon, or restraint of the joint itself; this can only be attained by the roller.

The same remark applies to the application of the triangular bandage to the *Elbow*, *Knee*, *Hand* and *Foot*. The methods of application in all these cases are similar. In the elbow and knee A is put upwards, the joint is covered by the middle of the bandage, and the long side lies horizontally across the forearm or the leg. B and C are then crossed behind the limb, brought round and tied in front, and A is then turned down over the knot and pinned. For the hand or

foot the limb is placed with the digits pointing to A, and with the end of the big toe or the middle finger, at the centre of the bandage. A is turned over the hand or foot; B and C are then brought up and crossed over the back of the wrist or ankle, and tied in a bow or reef knot behind. In the same way a *Stump* (Fig. 8) may be easily and well tied up, provided that pressure be not required.

FIG. 6.—*Bandage for Knee, etc.*

Bandages of the gluteal region. The most useful are the *Gluteal*, the *Perineal* and the *Scrotal*. In all of these, two triangles will be required, the one for the part itself being attached to the other, which is fastened as a belt round the waist. In the *Gluteal* bandage (Fig. 9), the belt being tied round, A is fastened to it behind above the posterior iliac spine, so that the middle of the base of the triangle falls just below the *gluteal* fold. B and C are then brought round the top of the thigh and knotted or pinned together. Both buttocks of course may be bandaged if three triangles are used.

The bandage for the *Perinæum* is usually applied by folding both bandages into cravats, and fastening one as a belt, and the other in the middle line behind and in front, passing it between the legs and spreading it out a little in the perinæum.

FIG. 7.—*The Hand. Bandaged.*

A more efficient bandage, which serves at the same time to cover the buttocks, can be made by reducing the bandage from a right angled to an acute angled triangle, by taking in a plait of about six inches in the base, or long side of the triangle, then fastening A in front of the pubes, and the middle of the base (for the width of the plait) behind, to the belt with safety pins.

FIG. 8.—*A Stump, Bandaged*

There will then be three folds of the bandage smoothly covering the perinæum, while B and C being brought round to the sides, will cover the buttocks, and may be fastened to the belt, towards the middle line in front.

FIG. 9.—*Gluteal Bandage.*

The *Scrotal* bandage generally requires a smaller second triangle than the others, or a large one folded once will do. It is adjusted thus:—The belt being put on as before, A is fastened to it in the middle line in front, so that the middle of the base comes to the central point of the perinæum. The scrotum and penis are then slung up and covered

by bringing up B and C, turning them round the belt on either side of the middle line, from behind forwards, and passing underneath first. They are then tied together in a bow or knot over the root of the penis, as is usually figured, or secured with pins, to the belt, as in Fig. 10.

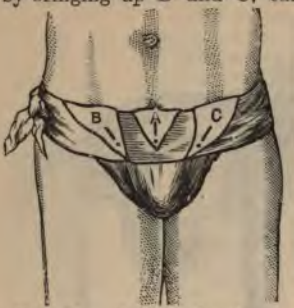


FIG. 10.—*Scrotal Bandage.*

Lastly, a tolerably efficient bandage *for one or both Groins* may be fashioned by folding a triangle as a scarf and then applying it as a simple figure of 8 (often wrongly called a spica), placing the middle of the scarf at the apex of the fork of the legs, carrying the extremities along the fold of the groin in front, and of the buttocks behind, crossing them at the great trochanter, and then carrying them round the pelvis to the opposite side, keeping below its brim, and tying the ends together (Fig. 11).

FIG. 11.—*Bandage for Groin.*

THE ROLLER BANDAGE.

In the case of the *roller bandage*, to apply it neatly is to apply it well, but the art of using this bandage *properly is not one* to be learned without practice.

even though it be freely allowed that the subject has been quite uselessly complicated by needless rules and patterns.

As to the materials for these roller bandages, a strip of any stuff which fulfils the conditions of sufficient strength, with lightness and softness, will do. The length of the strip varies from 4½ to 6 yards, the width from 2 to 4 inches; 2½ and 3½ inches being the commonest sizes.

For the purposes of description, roller bandages may be divided into *elastic*, *semi-elastic*, and *in-elastic* kinds.

Elastic bandages are of several kinds, woven, india-rubber, etc.

Semi-elastic bandages are either woven in a special manner or made of somewhat elastic material. Under this heading come all flannel bandages, domette, silk or cotton net, etc. The application of these bandages is much more simple than that of the in-elastic, for they will lie smoothly, if they are merely rolled on firmly, so that they hardly ever require turning or other manipulation. They should be rolled up rather loosely before use.

The *in-elastic*, or common bandages are the most frequently used, especially in hospitals, where the other kinds would be too expensive, even if they were firm enough for the requirements.

They are frequently made of "grey shirting" or unbleached calico, or the same bleached; a cooler, rather more elastic bandage is the so-called "water-dressing bandage." Very old worn damask linen is not infrequently used for covering pads or cushions, and, speaking generally, it may be said that washed stuffs are better than new, which often contain a stiffening dressing. They should always be torn, and no self-edges retained.

The general rule is to use the 2½-inch bandage for the arms and head, the 3½-inch for the legs and pelvis, and the 4½-inch width for the chest and abdomen.

Except for the trunk, however, it will be found that

the narrowest bandage is the easiest, and the most comfortable, to apply in all cases.

In order to apply the *common Roller bandage* to any part of the body, the first thing to learn is how to judge of the firmness and support required, and to distribute the pressure evenly about the limb. For this purpose the bandage must always be kept rolled up (dropping it is a sure sign of a bungler or beginner), and held (as in Fig. 12) three or four inches away from the part, while the finger and thumb are used to retain the bandage in its place when it is being applied. The next point is the manipulation known as "turning" or "reversing," by means of which the bandage is turned over on itself while it is being applied; the object of this turning is that the bandage may lie smoothly, and be firm as well, for inasmuch as all parts of the limbs, etc., are constantly varying in diameter, and the edges of the bandage will not stretch to make one side longer than the other, it follows that if it be simply rolled on in a spiral fashion, only the largest diameter of the limb covered by each turn of the bandage will be grasped by it, and the bandage will be loose elsewhere, as in Fig. 13.

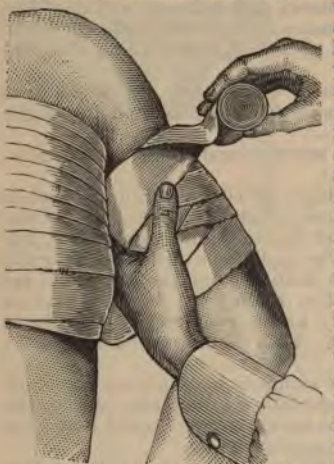


FIG. 12.—*Application of the Reversed Spiral.*

To avoid this, the bandage is, when necessary,

turned over as in Fig. 12, and by this means the upper and lower edges are frequently changed, so that the whole width of the bandage grips the limb. This turning requires a little knack, but is easily learned. The secret of doing it well consists in having the portion in the hand (Fig. 12) quite loose, so that by bringing the roller down, it naturally falls over. The thumb must, therefore, be holding the turn of the bandage last applied during this manœuvre. Moreover, the bandage should be brought across the limb with a good slope upwards, say 45° to its long axis, and the reverse similarly be brought boldly down, so that the bandage is well doubled over, otherwise some of the fold will appear on the other side of the limb when the bandage comes round.

FIG. 13.—*Forearm bandaged below with a simple Spiral; above with the "Reversed" Spiral Roller. The latter grasps the limb evenly, the former does not.*

The most common fault is that of screwing the roller round on its own axis, instead of allowing the bandage to fall over into position, as it should do almost of its own accord.

As a rule it is best to turn every time the bandage comes round, and the turns should be made in the same straight line; but these points are not essential, and indeed, both depend rather on the æsthetics of bandaging, than on any practical advantage.

Another rule, which may often be more honoured in the breach than in the observance, is that the bandage must be rolled on from within outwards. Thus in fractures of the thigh, if the leg be adjusted to the

splint, and the bandage put on in accordance with this rule, every turn that is made will tend slightly to increase that external rotation which is the great obstacle to proper position, while the reverse will be the case if the bandage be applied from without inwards.

FIG. 14.—*Reversed Spiral of Foot and Leg.*

The roller bandage with reverses is the commonest of all the ways of bandaging. It may be applied to the trunk or limbs (as in Figs. 14 and 15), to fasten splints, and on an infinite number of other occasions.

Nevertheless it is somewhat liable to slip, is not elastic, and is not suited for the neighbourhood of joints.

In its stead, a pattern of roller bandage which is hardly ever used in England, might well be employed more frequently, namely the *double-headed Spiral with Reverses* (Fig. 15). Its description, like that of many other bandages, is more complex than its application. The bandage is a combination of a simple spiral roller with a reversed spiral, so that whilst one head of the roller is applied spirally, each of the turns thus made *is covered and* fixed by a reversed turn made with the *other head.* Inasmuch as even compression can *always (other things* being equal) be more efficiently *made with a double-headed*, than with a single roller,

the value of this pattern lies in the firmness with which it can be applied to a limb, while it is nearly impossible that it should slip. The heads must of course be of unequal length; that used for the reverses being the longer. The pattern requires some practice to apply with ease, but the labour will be well spent.

FIG. 15.—*Double-headed Spiral with Reverses.*

A pattern which is at once firm and elastic, and which can be applied over most articulations, is the *Figure of 8* (Fig. 16). This bandage, when applied to the length of the limb, or over a joint so as to cover it completely, presents much the same appearance when finished as the spiral roller with reverses (compare Figs. 12 and 16), but in its application it is entirely different. The accompanying illustration (Fig. 16) will give a better idea of this than any words can do. The great point to bear in mind is to make the loops of the 8 as open as possible, by going boldly up the limb and coming down again as far as the bandage will allow.

As has been implied, this bandage may be employed in almost all the cases in which the turned bandage is generally used, and it is often really preferable, *being not less* firm and yet more elastic; but as a *rule its employment* is confined to the neighbourhood *of joints*, so that if a limb *and* a joint, or joints, have

to be bandaged, say the ankle, leg, knee, and thigh, there would be a *turn* or two placed round the foot, then the ankle would have the *figure of 8* (leaving out the heel), the leg the *turned* (see Fig. 14), the knee *the 8*, and the thigh the *turned* again.

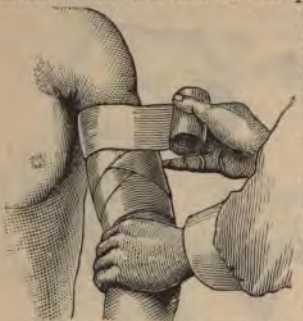


FIG. 16.—*Application of the Figure of 8 Bandage.*

One practical reason for this change is that the figure of 8 requires twice as much bandage to cover a limb as the turned spiral does.

The 8 bandage is also used for joints, simply as one or two turns, crossing over the centre of the flexor aspect of the joint. (Fig. 17.) This pattern is useful in a number of cases, as may be imagined.

The point of the Heel, and the *point of the Elbow*, with their respective joints, may be completely covered by a series of enlarging figures of 8, starting from the centre, having the crossing placed over the front of the joint, and the loops above and below the line drawn from the middle of the front of the joint to the

FIG. 17.—*Figure of 8 for Bend of Elbow.*

heel or the olecranon, and getting always more and *more open, and further away from the middle line as the bandage progresses.* (Fig. 18.) In this way the *elbow may be conveniently bandaged.* The heel

pattern is nearly or quite the hardest one to adjust of all the common forms. It is very neat looking, but it is seldom worth the trouble of its application save as exercise in bandaging.

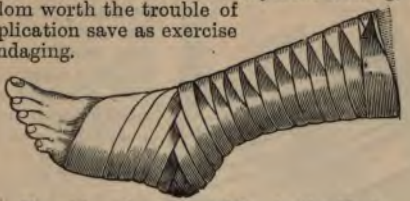


FIG. 18.—*Bandage taking in the Heel.*

The Spica (*spike or spathe*, a botanical term applied to a head of seeds arranged as in an ear of wheat) is extremely useful for applying firm pressure to joints, or fastening dressings over them. The pattern is the same, whether the bandage be applied to the shoulder, groin, thumb or great toe, and is that of a figure of 8, combined with a firm attachment to a limb in the neighbourhood of the joint,—the wrist for the thumb, the arm for the shoulder, the thigh for the groin, and the ankle for the great toe. Taking the *Spica of the Groin* as an example (Fig. 19), the bandage begins by two or three reversed turns from within outwards (or overlapping 8's) round the top of the thigh. The bandage is then carried outwards over the groin to just below the anterior spine of the ilium, and then round the back, taking care to keep just below the iliac crest. The bandage is then brought obliquely across over the symphysis pubis, crossing over the starting point to reach the outer part of the top of the thighs, and is then passed round it, and brought up ready to repeat the roll, but this time a little lower down, and so on till the groin and hip are sufficiently covered. The hip should be very slightly flexed at the time, and care must be taken not to slip on to the abdomen with the bandage as it is passed round the brim of the false pelvis.

With a long bandage the spica may be easily

enough applied to both groins, starting from one side and repeating every manœuvre on the other before returning; but in practice this is a bandage very rarely used, and requires mention only. The principle of the spica being understood, a detailed description of the different applications of the pattern is not called for, and the especial points only will be noticed. *The Spica of the Shoulder* is an extremely firm bandage (Fig. 20). The starting point is taken from the upper arm, the turns being rolled round as high as the axillary folds will allow. The bandage is then brought through the axilla, over the shoulder and round the chest, passing under the opposite arm-pit, and the crossing of the first turn should go as high up upon the shoulder as the bandage will lie. The succeeding turns will come successively lower and lower down, until the shoulder is covered in. This pattern requires a long bandage, and it may, as in the case of the groin spica, be doubled for both shoulders if required.

FIG. 19.—*Spica of Groin.*

The Spica of the Thumb (Fig. 21) is the regular bandage for the common sprain of that joint. As with the bandages for the phalanges, the roller must be quite narrow, not more than three-quarters of an inch wide. The spica is begun with a few turns round the wrist, from within outwards, if the outside of the thumb is to be the most supported, and the reverse if the ball be the part requiring the firmer

pressure. It is then taken round the thumb as high as the bandage will lie, and the succeeding

FIG. 20.—*Spica of Shoulder.*

turns, lower and lower (as in all spicas) till the ball is covered. It is then fastened round the wrist either by a safety pin, or by splitting the end of the bandage into two tails, which are tied together. *The Spica of the big Toe* (Fig. 21) is applied in precisely the same way, the ankle standing in the place of the wrist. It is, however, more difficult to apply without getting an awkward quantity of bandage material between the toes.

The Fingers may sometimes be sufficiently covered with a simple spiral bandage, or with reverses, or 8's, using a narrow bandage with neat edges, commencing at the tip, and finishing off at the root of the finger.

But, as a rule, to bandage the fingers or the whole

of the thumb efficiently, a combination of spirals and 8's with the spica is required. Taking the fore-finger

FIG. 21.—*Spicas of the Thumb and Big Toe.*

as an example (Fig. 22), the bandage is fixed by a few turns round the wrist, and is then brought up across the back of the hand from the radial side of the wrist (or along the palm from the ulnar side if preferred), and is passed between the fore and middle fingers, and half round the former as if to make a spica. Instead of completing the 8, however, the bandage is carried in a bold spiral up to the tip of the finger, which is then

FIG. 22.—Finger Bandage.

bandaged carefully downwards to the root. This may be done with simple close spirals, or with small 8's, or reversed spirals, if the bandage be wanted to look very neat. The bandage is then finally brought out between the fore and middle fingers, and descending, is crossed at the knuckle over the ascending portion, to go to the ulnar side of the wrist, round which it is fastened in the usual way.

All the Fingers may be bandaged successively in the same way (Fig. 23) with one bandage, by starting round the wrist as before, and going over first to the little finger, then round the wrist, then to the ring finger, and so on. In this way the palm is left free, and the back of the hand covered, but if it be desired to cover the palm and leave the back of the hand, this is readily done by starting from the ulnar side of the wrist and going across the palm to the thumb or fore-finger, as in the case of the single finger. As a rule, it is convenient to make a separate bandage of the thumb, but it may be included if desired. In any case a long bandage, not more than ¾-inch wide must be chosen, and unless the bandage be soft, and have clean-cut, unfrayed edges, it can hardly be made to look very neat.

FIG. 23.—*Bandage for all the Fingers.*

The principal use of this pattern is as a precaution against swellings of the fingers: it is not so often put on now as it used to be.

All applications of a roller bandage to a conical part, must inevitably be somewhat insecure unless put *on very tight*, and this is generally unwise. It is *therefore difficult* with any form of roller bandage to *apply exactly* the amount of pressure which is deemed

desirable to an amputated stump, and yet have the bandage secure against slipping off. *A bandage for a Stump* (Fig. 24), is a pattern known as the *recurrent* bandage. The roller for this should never be more than two inches wide, and for an amputation of the arm, or for a "Syme" it may well be still narrower. The bandage is first attached three or four inches above the stump by one or two circular turns, and then the thumb being placed over the middle of these turns in front, and the forefinger similarly behind, it is brought right over the face of the stump from the middle line in front to the same point behind. This reverse is kept in its place behind by the forefinger, and the bandage is brought back again, now a little to one side of the middle, but converging to it when it reaches its starting point. This is then fixed by the thumb, and the bandage is brought over again, passing this time to the other side of the middle line, and converging to it behind. These reverses are continued till the whole stump is covered, and then, by one or two firm circular turns, they are fixed in the position in which they were held by the thumb and finger, as shown in the figure. It is often wise to make a circular turn or two in the course of *making the reverses*, so as to fix those already made, *but in bandaging* a stump the dresser must avoid *making the parts* hot by unnecessary folds of the *roller. This pattern* may also be put on, so as to

FIG. 24.—*Recurrent Bandage for Stump.*

cover half or all the head, and may be made tolerably secure if care be taken that the circular turns are kept low down on the forehead and well below the occipital protuberance.

Amputation Stumps and also *the Head* may be bandaged by a method which, although it results in a pattern which looks like the recurrent, is yet different in principle and firmer—namely by the use of a "double headed" roller, a bandage, that is, both ends of which are rolled up towards each other in the centre. This is the bandage which, when applied to the head, is known as the "capeline." The application for a stump is the same in all respects. To put on the capeline it is more convenient for the patient to be sitting. The surgeon standing in front or behind takes one head of the roller (Fig. 25), and places the middle of the bandage on the occiput or the forehead. The two parts are then brought round and crossed on the forehead or below the occiput. One of the ends is then continued round, and the other, which is lying below it, is turned up and brought over the head as in the "recurrent" bandage. It is now met by the other half of the bandage which has gone round the head, while this half has gone over it, and the former, continued round, fixes the bandage so that it can *again be brought* over the head, when the manœuvre *is repeated.* In this way, by adjusting the subsequent turns of the bandage alternately to one side

FIG. 25.—*Capeline Bandage.*

and the other of the first one, which was in the middle, either half (Fig. 26), or the whole of the head may be covered with folds converging to the middle line in front and behind, and a somewhat attractive bandage is made. Its appearance is however almost its only good quality. It is firmer than the simple recurrent bandage, but it is still very liable to slip. It is troublesome to apply, hot, and if at all tight round the head, apt to become painful, while it fulfils few indications which cannot be at least as well met by

FIG. 26.—*Capeline for Half the Head.*

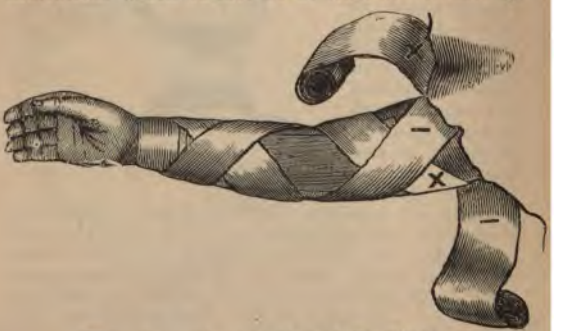


FIG. 27.—Double Spiral Bandage.

the more homely, but far more comfortable triangular bandages (Fig. 2). It may sometimes be useful, however, when applied to a stump.

Another application of the double headed roller which is not often used in this country, may here be mentioned, namely the *Double Spiral* (Fig. 27). The two spirals crossing each other in front and behind, make an open bandage which is convenient enough for retaining dressings.

The *Twisted or Knotted* bandage for the head (Fig. 28) is generally described as one which requires a double headed roller, but this is not at all necessary or desirable. It is an extremely useful bandage, and is easy to apply. For example, taking the neighbourhood of the temple as the situation in which the pressure of the twist is required, the bandage should be unrolled for about a foot, and the end held in the right hand, which is kept close to the temple. The roller is then carried round the forehead and occiput, so that it comes back to the unrolled end at the wound. The roller is then twisted round sharply, as shown in the figure, and is carried down below the chin and round to the vertex. On coming to the temple again the same twist is made, and the roller is once more passed round horizontally; when sufficient pressure is obtained, the bandage is fixed by knotting the two ends together.

FIG. 28.—Twisted Bandage for Head.

The *Four-tailed Bandage* is a very useful pattern and serves for the attachment of dressings in wounds *about the chin* or face *as well as* for fractures. For the bandage (Fig. 29), a piece of shirting

four or five inches wide and two feet long is required. It is then doubled on itself and torn down, until a

FIG. 29.—*Four-tailed Bandage for Jaw, with Chest Bandage.*

piece four inches long only is left undivided in the middle. In the middle of this a slit two inches long is generally cut, in which the point of the chin is inserted, but this is often omitted.

The middle of the undivided part is placed over the chin, and the under pair of the four tails made by tearing the bandage, are then brought up over the side of the face in a line with the masseter muscle and loosely knotted or held half an inch in front of the vertex of the skull. These pass underneath the other pair, which are *brought round to just* beneath the occipital protuberance, *and firmly tied* together with a reef knot. The *first pair on the* vertex are then tied with sufficient

firmness to fix the lower jaw against the upper one; and finally, the vertical part is kept from slipping forwards, and the horizontal from slipping downwards, by tying the four tails together (this is not shown in the figure). In adjusting this bandage it is necessary to see

FIG. 30.—*Breast Bandage.*

that the length of the undivided part fits the jaw to *which it has* to be applied, and this can only be done *by trying it* on before it is finally fixed.

In bandaging the Chest there is a tendency for the

bandage to slip down on account of the decrease in size of the thorax from above down. This is best overcome by using a brace and bandaging from below upwards. A piece of bandage should be split in the centre, and the head passed through the opening, so that one end hangs down in front and the other behind. The bandage should be applied over this, being fixed by one or two turns round the chest, and then carried up with a reverse in each turn, thus overcoming the tendency to form an open spiral. Finally, the two ends of the brace should be brought up and fixed (Fig. 29).

To bandage *a Breast*, the roller is first fixed by a couple of turns round the chest, starting from and below the affected gland; it is then carried upwards over the lower part of the breast and the opposite shoulder, descending across the back to the original starting point, then horizontally round the chest. These turns are then repeated, each oblique turn being fixed by the succeeding horizontal one, and rising higher on the breast until it is covered. It is important always to bandage from the affected side (Fig. 30).

The *single* T *bandage* (Fig. 31) is most frequently used for fixing dressings to the perinæum. Its application there is simple enough. The horizontal part being fixed round the waist, the other end is brought round between the legs and fastened in front.

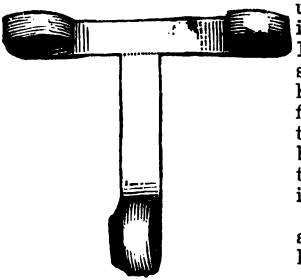


Fig. 31.—Single T Bandage.

The bandage can also be applied to the head or elsewhere.

For the perinæum, a good average size is *five feet for the horizontal* piece and three feet for the *vertical, and it should be* about three inches wide.

For the perinæum, a better pattern than the simple T is the "*Double* T" complete (Fig. 34), or incomplete (Fig. 33). The latter is made from the simple one

FIG. 33.
The Double T *incomplete.*

FIG. 34.
The Double T *complete.*

by tearing the perpendicular portion into two tails, except for five inches behind. By using either of these bandages the awkwardness of bringing up the single vertical piece in the middle line in front is avoided.

The T is also a very good bandage to apply to the head, to retain dressings. If used *for the Head* the vertical strips should be two feet long, and the horizontal one about a yard and a half, to allow of its going round the head twice or thrice. The width should be three quarters of an inch. *For the Nose* a good bandage is the double T applied as in Fig. 35, or the single T with a slit in the vertical part, of the requisite size to partly admit the nose; while if, in addition, a slit be made in the middle of the horizontal part of either the single or double T, for the

mouth, it becomes a good bandage for the application of dressings *to the lips* (Fig. 36).

FIG. 35.—*Double* T *applied to Nose.*

The single or double T, or a T with a small triangular piece inserted at the junction of the vertical and horizontal portions, makes a good bandage for the ear, and other modifications may easily be imagined.

FIG. 36.—*Double* T *Bandage for the Nose and Mouth.*

OF KNOTS.

Among the smaller accomplishments of the complete surgeon must be reckoned the art of making a *"reef," "bow,"* or "slip" knot, or a "clove-hitch,"

neatly, quickly, and firmly. The importance of this need not be insisted on, for in surgery, very literally and very often, it happens that life hangs on a thread, and the results may be disastrous if this be insecure. But we believe that to describe in words the actual movements of the fingers in making these knots, would be only waste of time; it is a knowledge which each student must acquire for himself by practice, after he has been shown how to do it.

FIG. 37.—*Reef and Granny Knots.*

In Fig. 37, the left hand cut shows a cord tied in a *Reef* knot; the right hand one in a *Granny*. Fig. 38 shows a *Clove-hitch*, which in the left hand cut is half

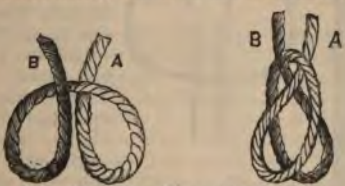


FIG. 38.—*The Clove-hitch Knot.*

made, and in the right is shown completed, by placing the loop A in front of loop B. Where firmness is wanted, as for the ligature of a vessel, and for all ordinary purposes of knotting, the reef is the one for *surgeons to* use—the *granny*, never—and the dresser *must go on* practising the manœuvres until his fingers *acquire* a perfect automatic skill, so that he never has

to think of their individual movements. The *Clove-hitch* is very useful when a pull upon any part is required; as, for example, in dislocations of the shoulder, when a jack towel is fastened by this knot round the arm. Its great advantage is that it gets firmer the more it is pulled upon, while yet it can be loosed in a moment. Moreover it has no tendency to slip like a noose. There are one or two ways of making it, all practically coming to the same thing, but the main idea and purpose of the knot can be gathered from the figure.

We need not waste time or space in discussing the virtues of the bow or half bow, while other knots well known to sailors or builders, as the carrick bend, the bow line, or weaver's knot, etc., are not used in surgery; but what is known as the "Staffordshire" knot is a very useful one for securing the cut end of a vascular pedicle by transfixing it with a double threaded needle on a handle, and slipping the loop over the stump down to the entrance of the threads into it (the needle having been withdrawn). One of these entering threads passes over and the other remains under the loop, so that they can be tightened, one first and then the other, and lastly must be tied in a reef knot, so that both halves of the stump are simultaneously but separately constricted by the single string and knot (Fig. 39).

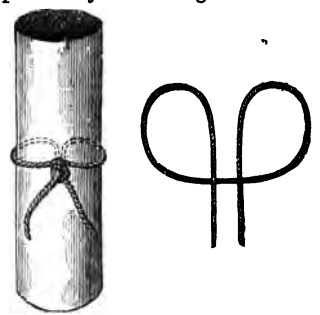


FIG. 39.—*Staffordshire Knot.*

CHAPTER II.

Of The Use of Adhesive Strapping.

Adhesive strapping is very largely employed for purposes of mechanical support, the main uses to which it is put being:—

(1.) The fixation of splints and apparatus.

(2.) The immobilisation of parts, as in strapping for fractured ribs.

(3.) The production of uniform pressure and support, a common example being the firm, even strapping of the knee joint for injury or disease.

(4.) To maintain the edges of wounds in contact, or to relieve tension on superficial sutures. It is not much used now for that purpose on account of the difficulties of rendering the strapping aseptic.

The use of medicated plasters does not fall within the scope of this present work. A large number are now in use, and their application in appropriate cases is of the greatest use.

The ordinary *Adhesive strapping*, diachylon or lead plaster, is the form which is still in most general use and, unless it is otherwise mentioned, must be understood to be the material employed. It is sometimes spread on paper, when it is almost useless, but is generally laid on linens of varying fineness, or upon holland. No good purpose is served by using a fine linen, and the best strapping for all ordinary occasions is what is known as "Leslie's Hospital quality," sold in rolls eight inches wide.

Other kinds of plaster are often spread upon chamois leather, or on white basil.

Recently, a very useful form of strapping, the basis of which is indiarubber, has been introduced, namely, Seabury and Johnson's *Rubber Adhesive plaster*. Its advantage is that no heating is required, the adhesive

surface being protected by a layer of coarse muslin until it is used.

Another very good kind, for small surfaces, is the *Isinglass* plaster, made by painting thin silk with that material. It requires wetting only, and is very cleanly.

For clean cut wounds about the face, etc., or in ophthalmic surgery, and in other cases where great nicety is required, court plaster or gold-beater's skin (a thin film of collodion) is generally used.

The use of the finer forms of plaster has been, however, largely replaced by the use of gauze and collodion. To cover a small wound a layer of gauze is placed over it and collodion painted on; or if the wound gapes and the edges have to be drawn together, the gauze having been laid over the wound is fixed to one edge by means of collodion which is painted on; when this is dry, traction is exerted so as to draw together the two lips of the wound, and the gauze is fixed to the opposite edge in a similar manner.

If strapping is to be applied directly to a limb for the purpose of providing even support and pressure, the following points should be carefully attended to:—

(1.) Strips should be cut rather longer than will go once round the limb, so that the ends when brought round overlap well. The width will vary according to circumstances, the most useful being from 1½ to 2 inches for ordinary purposes. A long strip should never be wound spirally round a limb. It would be impossible in this way to make the strapping lie evenly.

(2.) It should always be thoroughly warmed first, for which purpose cylindrical hot water tins are commonly used, but the heat of a gas burner or open fire will serve the purpose.

(3.) The centre of the piece of strapping should *then* be applied to the middle of the back of the limb, *and the ends brought* round to the front where they *overlap. In doing this* the strapping, whilst being *gently drawn upon* should be allowed to fall naturally

into position to prevent one or other border cutting into the flesh. Care must be taken that whatever traction is exerted is not so great as to interfere with the circulation.

(4.) Each piece as it is applied should overlap the preceding one for from a third to a half of its width.

(5.) Each piece should be moulded to the limb by the palm of the hand, so that no wrinkles are left in it.

(6.) The strapping should be applied directly to the skin; there should be no bandage or lint beneath it. The only exception to this rule is when the strapping is used in conjunction with a dressing. A familiar example of this is the use of Scott's dressing.

When the strapping is required to accurately adjust or support the edges of wounds, of amputation flaps or the like, the strips should never be stuck first on one side and then pulled over to the other, or "cockling" will certainly occur, but should be cut in pairs, and then applied as in Fig. 40, or on some

FIG. 40.—*Strapping applied* to close a Wound accurately.

similar plan. One strip is placed on one side of the wound, and the other on the other; the middle parts

are slipped the one within the other, and then an even, regular pull can be made simultaneously on both sides.

Some special cases in which strapping is a common plan of treatment will here be shortly described.

In the treatment of fractured ribs, pieces of strapping should be taken long enough to overlap the middle line of the body both behind and in front by about four inches. They may be used about three inches wide in an adult, and should be laid on very evenly and carefully, each piece overlapping the last for half of its breadth. Not only in fracture, but where the thoracic walls have been badly bruised, it is often desirable to place them as completely at rest as possible. This may be done very effectually by strapping them in the same way as if the ribs had actually been broken.

Enlarged phalangeal joints may often be strapped with common plaster, or with the iodine strapping to be hereafter mentioned. The method of doing this is the same as for the larger joints, and does not require a separate description.

The Wrist, either for a simple sprain or for the common teno-synovitis of the extensors of the thumb lying over it, may be strapped with strips of linen or leather plaster applied in the same manner as for the knee, Fig. 41; or a single piece of chamois leather may be used in the way which is described below.

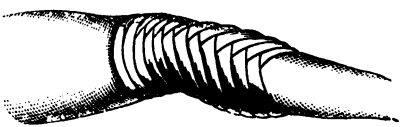


FIG. 41.—*Knee, Strapped (ordinary way).*

Every dresser should know how to strap the Knee *joint efficiently, for it is* one of the principal methods *of treatment of chronic* derangement of this articula-

tion. The usual plan is to apply strips of the plaster, overlapping each other, from below upwards, until the whole joint is covered. This may be done with the plaster spread on stout holland.

Another way of strapping this joint in the less acute forms of its disease, is one which is little known, and may here be described.

If the plaster be spread on chamois leather it will be found quite easy to firmly envelop the whole joint with one piece, provided the adhesive material be well spread and well warmed. The piece should be oblong, and large enough to go round the knee and overlap about one inch, and should be from ten to fourteen inches long. After warming it well, the centre of the leather must be very evenly applied to the skin in the popliteal space; one half of it must then be drawn over the inside and front of the knee with force enough to produce the pressure required: this will be found to stretch the leather sufficiently to bring it well over the front. The other half is then brought quickly and firmly over the other side. If the leather has been properly warmed, it will stretch so as to overlap for nearly three inches, and the plaster will be applied so closely to the skin that it will follow every wrinkle in it when the knee is flexed, and yet a firm, even compression will be attained (Fig. 42).

FIG. 42.—*Knee, strapped with one piece of Chamois Leather.*

The Ankle, similarly, may be strapped either by narrow strips of linen or leather, or by one broad piece of chamois, the middle of which is applied to the sole of the foot, and the two ends brought up and crossed in

a figure of 8 over the front of the foot, and round the malleoli.

Long strips of adhesive or diachylon strapping may be usefully employed to support, and to a certain extent, to compress *an enlarged or inflamed Breast*. The centre of the strips must be placed below, and the ends crossed above, working from below upwards, the breast being thus supported by the overlapping plaster, but as a general rule, this kind of support can be much more easily and comfortably maintained by the use of "Martin's" rubber bandage.

A *Stirrup* (Fig. 43), is a very common mode of employment of strapping material; by it, extension can be applied to a limb by means of a weight and pulley, or, less frequently, through some mechanical arrangement of rubber springs.

Stirrups may be applied to various parts of the body, but they are most frequently used in the treatment of hip disease and fractures of thigh-bone; and a description of the application of one to the leg will suffice for other forms as well.

The Stirrup is put on thus:—A piece of wood about a quarter of an inch thick is taken (it should be square, and the width of the ankle at the malleoli), and placed in the middle of a broad strip of strong strapping; this wood forms the foot piece of the stirrup, and the broad strip is fastened to it by some more strapping wrapped round it. The side strips of the stirrup are then warmed and adjusted to the outer and inner sides of the leg so that the foot piece is quite parallel to the sole of the foot; they should be carried up to about the middle of the thigh; they are then firmly fastened on by overlapping strips of strapping, put on obliquely, as shown in Fig. 43, from the ankle upwards. A roller bandage may be put over all, but this is not generally necessary.

A neater and more comfortable, but a more expensive way, is to use strips of white basil leather, spread with some adhesive plaster. These are put on in the same way as the strapping, and look very workmanlike.

The leather strapping is especially useful in stirrups for hip disease. In extremely tender cases, even chamois leather strips may be used. The strapping should be applied directly to the skin, the only bandage allowable beneath it being a few turns round the ankle joint to protect the malleoli.

It only now remains to fasten the weight to the stirrup, and to adjust the pulley at the end of the bed. The first is easily done by boring a hole in the wooden stirrup-end, passing a piece of stout blind cord through it, and securing by a knot. The most convenient weight to use is a shot tin. They are generally sold with the measure of the weight of shot which may be put in them, stamped outside.

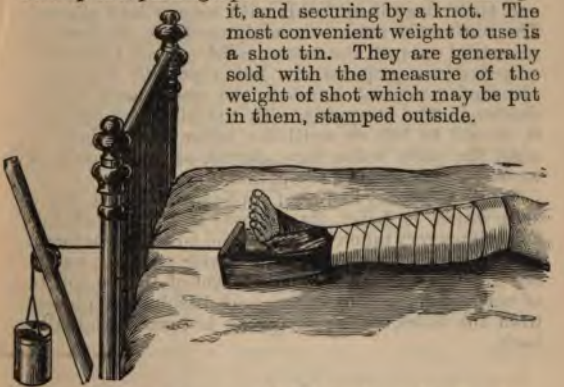


FIG. 43.—*Stirrup and Weight adjusted to Leg.**

The weight and pulley should be frequently looked to, for the cord may jam, or yet more often, the long splint may get imbedded in the bedclothes or mattress, so that no ordinary weight would be of the least use.

It has hitherto been assumed that the strapping has been employed simply for the purpose of mechanical support, or of compression. But frequently the adhe-

* *The strapping should be shown continued to the middle of the thigh.*

sive material possesses in itself (or is applied over ointment possessing) medicinal properties. As examples of these special plasters the *Emplastrum belladonnæ* and *E. opii* are frequently used for their anodyne properties; the *E. hydrargyri* or *hydrarg. c ammoniaco* and *E. potassii iodidi* for promoting absorption.

One of the most effective modes of treatment of enlarged joints, inflammatory bursal enlargements, chronic orchitis, etc., is to cover strips of lint with some absorptive ointment, to lay them over the part, and then strap it up firmly with soap or lead plaster. The ointments most commonly used are the various mercurial ones, all the *iodine*, *iodide of lead*, and *iodide of potassium* preparations, but especially the *camphorated mercurial ointment*, the well-known *Scott's dressing*. The strapping, with the ointment beneath it, should be left on until the latter is absorbed, or until the parts below have shrunk so as to make it loose; it may then be re-applied if necessary.

When strapping has been applied to any part of the skin which is hairy, its removal is always painful, sometimes very much so, unless the adhesive material be softened. This may be done with very hot water, but a better way is to soak a pledget of lint in spirits of turpentine, and to soften and dissolve the plaster from the hairs, as the strapping is turned gradually back.

CHAPTER III.

Of Splints

Definition. A splint is *a contrivance or apparatus made of some material, possessing absolute or relative rigidity which, when attached to some part of the body, increases its natural stiffness or remedies undue mobility caused by disease or injury.*

In many parts of the body, an uninjured bone in the neighbourhood of one that is broken, will often serve to keep the fragments of the latter in their place, and in some parts the attachment of ligaments, etc., will serve the same purpose. Thus, in fractures of the fibula, the tibia, if unbroken, will make a very efficient splint for it. The same may be said of the ribs, where the muscles and ligaments which form, with them, the cage of the thorax, very often prevent serious displacement.

A fractured lower jaw, again, may often be kept in good position by keeping the fragments closed against the upper jaw, and many other instances might be adduced.

There is hardly a limit to the number of the materials which may be pressed into the service of the surgeon, to form splints in the first instance, in cases of fracture or of some other injury.

The usefulness of cardboard, book-covers, newspapers, firewood, and many other things familiar in daily life, will be mentioned in this connection under the heading of "Immediate Treatment of Fractures."

Surgical splints may be divided into those of some fixed form and shape, and of some rigid material, as wood or iron, to which the trunk or limbs may be attached by bandages or strapping; and those which *are capable of* being moulded to injured or diseased *parts, to give* them the needful support or to remedy

deformity. All of these latter possess the property of being soft when applied, and then of setting or hardening.

Rigid Splints.

These are for the most part of wood or iron, though other materials, such as vulcanite, etc., are sometimes used. They may be sub-divided into those of a simple, and of a complicated form.

Plain *wooden splints* are the simplest of all, and will need little description. In most cases they are simply pieces of white pine, of various lengths and breadths, planed, and with their edges rounded off. They are used for fractures of the limbs, or to prevent flexion of joints, as in the common "back splint" of the knee, etc. Not infrequently they are made of strips of wood, lined with canvas, on the plan of the kettle-holder splinting, to be presently mentioned; and other materials, such as rattan, cane, etc., have been used from time to time.

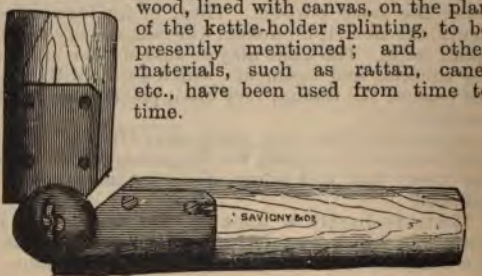


Fig. 44.—*Wooden Angular Splint with Hinge.*

Angular splints (Figs. 44-47) with or without a hinge at the elbow, are very useful forms in various injuries of the arm, and like other forms of wooden apparatus, (*e.g.*, the back splint for the knee), are far more comfortable if they are somewhat hollowed out, a proceeding which adds but little to their expense.

Figs. 46, 47, illustrate a very useful form of an *angular metal elbow* splint, lately devised by Mr. R. *Jones, of Liverpool.*

Of the more complicated splints, in which wood is the principal material employed, the chief are "Bryant's" for the excision of the hip, fracture of the thigh, etc., "Gant's" for the treatment of genu valgum, splints for fractured patella, and the double inclined plane.

FIG. 45.—*Simple Angular Splint.*

It is often necessary, in cases of compound fracture, or after excision of joints, etc., where we must be able to get at a wound which therefore must not be covered

FIGS. 46, 47.—*Angular metal Elbow Splint.*

by the splint, to make *an interruption*, as it is termed, and although this is done in iron as well as in wooden splints, it is far more easy in the latter, as in Fig. 48. In making such a splint it is best to choose one as if the necessity for the interruption did not exist, and

then to saw away the parts required to be removed, *after* having fastened on the iron supports

FIG. 48.—*Iron Back Splint, with "Interrupted" Wooden Side Splint.*

Iron splints may be simple or complicated; among the former may be mentioned that common angular elbow splint (Fig. 49), generally having a hinge at the elbow, the simple back splint for the leg and thigh, with a foot piece, commonly used for fractures of the leg, generally called "Neville's splint," and the different patterns of that very useful splint, "MacIntyre's" or "Liston's" (Fig. 50), which consists of a movable foot piece, and leg and thigh pieces, with a joint between them, and with some

FIG. 49.—*Iron Angular Splints, with arrangements for Pronation and Supination.*

mechanical arrangement of screws, or rack and pinion, to alter the angle at the knee. These can also generally be adjusted for limbs of different lengths.

All leg splints for fractures should be furnished with cross pieces, to enable the limb to be swung from a cradle.

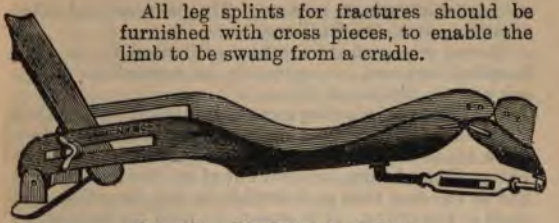


FIG. 50.—*MacIntyre's Splint.*

There are numerous patterns of splints used after excision of the wrist, elbow, and knee, of which examples are given in Figs. 47 and 48.

Splints are also made of tin or some other flexible metal which can be readily bent into any required shape. These are often used in the treatment of talipes.

Fig. 51 is a drawing of a German flexible splint which is now being largely

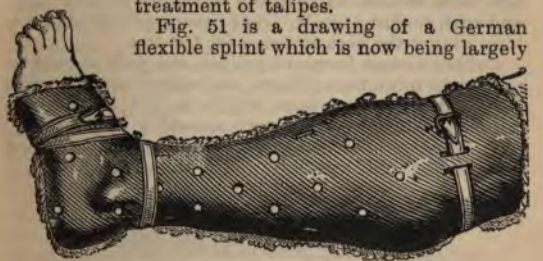


FIG. 51.—*Dr. Guillery's Flexible Splint.*

used in this country. The splints are made of different sizes for the arm, forearm, thigh and leg, and are accurately blocked to the contour of each limb, and retain them in good position in cases of fracture after the *displacement* has been reduced. They can readily be *blocked* up differently if any abnormality in the shape *of the limb* be present. The splint can be procured

at most instrument makers. They are named after their inventor, Dr. Guillery.

Woven wire splints are also still used in cases of fracture, but not so commonly as heretofore. They are at once light and strong.

Kettle-holder Splinting is made by attaching long thin strips of wood to canvas or leather with strong glue. It is made in large sheets, and splints of different patterns can be cut or sawn out of it. Its great merit lies in the fact that it is flexible in one direction and rigid in the other. It is especially used for fashioning splints to partially encircle a limb, as in fractures of the arm, or in combination with a back splint in cases of broken thighs.

All splints before they are applied, should be *padded*, to avoid injury of the softer parts. This may be done in several ways, and with different materials. Of all paddings, however, the most elastic and convenient is tow, well teased, so that the fibres lie all one way, and with no lumps in it. Soft linen, such as old napkins, makes the best covering for the tow.

For the simple forms of splints, the pads should be made like miniature pillows, and either sewn on with a lace stitch at the back, which is best, or fastened with bands of strapping very smoothly applied (Fig. 52). Pads should always be complete cushions, not layers of tow laid upon the splint and covered.

FIG. 52.—*Pad, sewn or strapped upon a Splint.*

Next to tow as a stuffing comes cocoanut fibre, and, last of all, cotton wool, which is very apt to work into *hard lumps. Very good* but extravagant pads may *be made of several* folds of lint.

In all cases where moist or oily dressings, or the

given on Figs. 53 and 54, but in all cases the shape should first be cut out in paper and fitted, as nearly as possible, to the limb. The figure should then be marked out on the leather before cutting.

Splints may be made of leather for the ankle, knee, hip, spine, shoulder, elbow, wrist and jaw. The question of spinal splints will be considered in a separate chapter, and inasmuch as among the rest, those for the elbow and knee are by far the most common, and as many of the directions for making them will hold good for splints fashioned out of the other plastic materials, these two will be described in detail.

The *back splint for the Knee* is a splint which is often required for the treatment of fractured patella in the later stages of union, or for chronic disease of that joint, or after its excision has been performed. The pattern should first be cut in paper (of the shape shown in Fig. 53, No. 5), of such a length as firmly to grasp the leg and thigh, and of a width such as will allow an interval of about half an inch between the two sides of the splint in front. The paper pattern must be carefully fitted to the part, and the leather then cut out from it. This then must be thoroughly softened in a bucket of cold water, which will take from twenty-four to forty-eight hours; if it should be desirable to shorten this time, a tumblerful of vinegar or of dilute acetic acid may be added to the water, when three or four hours will be enough to soften the leather. The splint should then be applied to the limb, which has been previously covered with a flannel bandage, and bandaged on as firmly as possible, while it is, at the same time, moulded to fit the curves with all the exactness possible. Too much care cannot be exercised in this, the most important stage of the work. When it is done, the leather must be allowed to "set" on the limb, a process which will take some hours, when it *may* be carefully taken off and allowed to dry *thoroughly*. It is then fit to be trimmed and finished *by cutting* away whatever leather is redundant, or

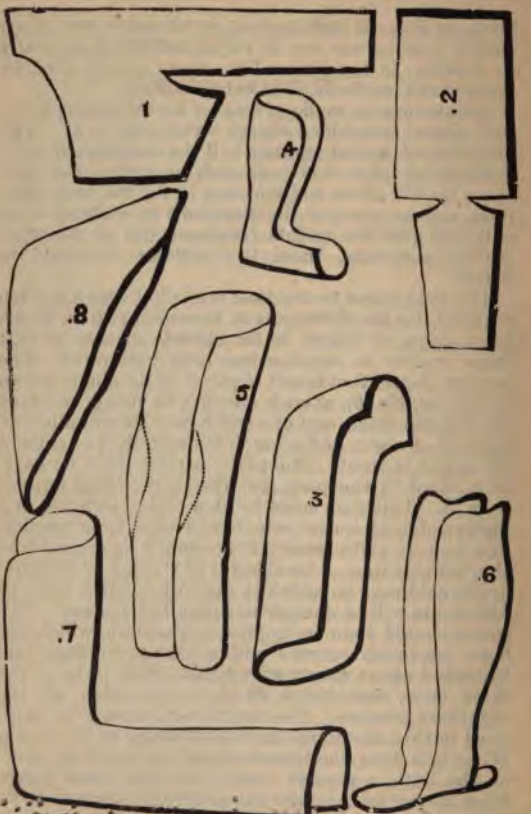


FIG. 53.—*Patterns for Moulded Splints*

FIG. 54.—*Patterns for* Moulded Splints.

where the edges seem as if they might chafe. The edges, too, must be bevelled on the inside with a very sharp knife. If it is considered advisable further to strengthen the splint with an iron backing, this may now be rivetted on by a smith.

The lining is best done with chamois leather; it must be cut out from the same shape as the splint, but large enough to overlap it everywhere for about half an inch. The inside of the splint is now brushed over with very hot thin glue, and the chamois leather stuck on. It will adhere very firmly; and the edges must be turned over and similarly fastened down, and then trimmed to an even width.

The finishing touch is given by punching the necessary holes for lacing and inserting the brass rings with the proper boot-maker's tool. If it is desired to polish the leather outside, this may easily be done with beeswax and oil melted together and rubbed in, while warm, with a flannel.

In Fig. 55 is shown an ordinary knee splint, finished and applied.

There are two principal ways of moulding an angular splint to the elbow, both about equally efficient.

FIG. 55.—*Moulded Back Splint for the Knee, in Leather or Felt.*

The pattern for the first is as in Fig. 53, No. 2,* the

* In this pattern the portion for the forearm is drawn too small.

arm piece cut long enough to reach to the axillary fold, and that for the forearm, to the wrist. The leather is softened as before, and then, by bending the arm piece up at right angles to that for the forearm, they will overlap each other at the elbow, the arm ones going outside. The splint thus bent, is moulded by bandaging it on in the same way as for the knee, and may be trimmed, lined, and finished, as has just been described. The pieces at the elbow are fastened together by a few stitches of whipcord, or by passing through and bending over, some of the common clips used to fasten papers. This splint, it will be seen, is made of one piece, and may be laced along the middle line in front or fastened there by two or three webbing straps. It is shown finished in Fig. 56. In the other pattern, two pieces of the shape of No. 11, Fig. 54, are cut out, softened and moulded to the outer and inner sides of the arm and forearm. They may, when finished, be simply fastened round the limb, by webbing or leather straps; or a neater way is to glue the two halves along the back to a broad piece of tape or soft leather, so as to make a hinge; they then can be laced together along the front. The advantage this splint has over the other is that it may be put on and off very readily, but it is more troublesome to make, and is not quite such a firm support.

FIG. 56.—*Moulded Elbow Splint.*

It often happens that joints suitable in other ways for leather splints, are too tender to bear the necessary manipulation of moulding. In this case, if it be decided to have one of this kind, a plaster cast must

be taken of the limb, and the leather moulded to that ("blocked" as it is termed), when much greater force can be applied.

A material closely resembling leather in its mechanical properties, but more easily applied, is now to a great extent superseding it for moulded splints, both large and small. This is felt, saturated with some resin, in such a way, that while it preserves its porosity, and is but slightly increased in weight, it is rendered quite plastic by heat, but becomes again extremely stiff when cold. The advantages it possesses over leather are its lightness and porosity. Its disadvantages are that it is not so strong, and is more liable to crack or break. The fact that it sets very quickly cuts both ways, being sometimes useful, sometimes embarrassing. This material is well known under the name of *poroplastic* felt. It is sold in sheets of various thicknesses and qualities; of the latter the medium are the best.

The patterns in Figs. 53, 54 are those in most common use; most of them may be had ready made, or they may be cut out of sheets of the material. The best way of softening is by means of a steam chamber, made for the purpose, but an oven will do very well if the felt be first thoroughly moistened, and for most cases immersion in nearly boiling water will answer the purpose. If softened in this way, the felt must be laid flat and quickly pressed between the folds of a towel to remove the superfluous water, before it is applied to the limb.

The method of moulding is in all respects the same as for leather, save that, in consequence of the extreme rapidity with which it sets, the manipulation has to be very quickly performed. These splints may be lined, and eyelet holes punched as in leather, but care has to be taken not to break the edges. If required, portions of the splint may be left unstiffened, or the resin may be removed from such parts after moulding, by soaking them in methylated spirit.

Next in usefulness to poro-plastic felt comes gutta-

percha sheeting, which is even more readily moulded. It is not, however, porous, and is not so comfortable. In durability it is far inferior to leather or felt; on the other hand it admits of much more complete softening, so that it can be moulded more easily to tender parts, or to parts of a complicated shape.

The sheeting, of about the thickness of sole leather, having been cut out, is softened in water as hot as can be borne by the hands, and rapidly moulded to the part, which should first be moistened. If the water be of the proper heat, some care will be required to keep the sheet from losing its shape through undue softening; and if it be too hot this will certainly happen, while on the other hand, water merely "hot" (*e.g.* 100° F.) will not render it sufficiently pliable. The splint will quickly set sufficiently to allow it to be removed without losing its shape, and it should then be plunged into quite cold water, which will give it greater rigidity than it would have if allowed to remain on continuously. It may then be trimmed and, if desirable, lined, and punched for lacing as before. It will, however, generally be best simply to put it on the limb over a piece of soft lint, and to secure it with webbing straps and buckles, for the gutta-percha is rarely durable enough to make the former proceedings worth the trouble.

In the absence of leather, felt, or gutta-percha, a fairly efficient moulded splint may be made from common *millboard* or *cardboard*. After having been cut out of very stout board to the required form it must be thoroughly softened in water, and the details of manipulation may be in all respects similar to those for plastic felt. In most cases, however, the best support will be obtained by cutting the millboard in strips, about 1½ inches wide, softening, and then applying them to the limb, one or two at a time, while a roller is at the same time applied, so as to mould and fix them as well. In this way the strips come to be within the layers of the bandage, and give considerable rigidity to the limb. The splint thus applied has to

remain on, and cannot be finished up like the preceding ones, and for this and other reasons the cardboard splints are now nearly superseded by the felt.

There remain to be mentioned one or two materials, occasionally, but more rarely used in general or special surgery, as, for example, *gutta-percha* in mass, *vulcanite* and *gum resins*. All these are principally used in dental surgery, or in cases of fractured jaw, but the student may be reminded that for splints of delicate construction, materials such as these may be used; so, too, metals, other than those already mentioned, may sometimes be found useful, *e.g.*, lead, silver, or aluminium, the last being specially valuable for its lightness, although its cost prevents its extensive employment.

Division II.—Moulded splints made of bandages, saturated with a plastic material. Whatever be the stiffening agent used, the principle is the same for all the splints described in this division, namely, that the part required to be supported must be covered with bandages, into the interstices of which there can be introduced some material which, soft at the time of application, becomes afterwards hard, so that the part is enclosed in an accurately fitting case.

The materials in common use for this purpose are *plaster of Paris*, *gum* and *chalk*, *silicate of potash*, *stearine*, and *starch*; *glue* mixed with spirits of wine, to enable it to dry, has also been used. These may be described in the order just mentioned.

Plaster of Paris is the best, and the most commonly used material for most splints; the part to be splinted is first evenly covered with a soft flannel bandage, or some well-fitting flannel clothing. The bandages, which should be about two-thirds the length of an ordinary roller, and 2½ inches wide, are made of a very coarse muslin, generally called *crinoline*.

They are prepared by rubbing the dry plaster, in *powder, well into the* meshes, and then rolling up *loosely. When made* they should be kept lying *their sides in a tin box* till required.

To make the splint it is only necessary to put the bandages in water till all the plaster is well soaked, and then to roll them on the limb, allowing them to take their own course to a great extent, avoiding reverses, and not attempting to form any regular pattern. The more oblique the general direction of the bandage is, and the more figures of 8 are made, the better. Three layers of the bandage are generally enough to make a firm case.

In all cases where a stiff bandage is applied to the leg, great care must be taken to keep the foot at right angles. This is easily done by passing a clove hitch round the big toe with a long piece of bandage, which may be fastened to the head of the patient's bed, or round his neck. When the case has been applied, it must be kept quite still until it has set; this will require from half an hour to three hours, according to the weather, the dampness of the bandages, etc. The setting may be hastened by hot water bottles or proximity to a fire.

Sometimes it is desirable to retard the setting; this can be done by soaking the bandages in mucilage and water. When this plan is followed, some surgeons cut the saturated and moistened bandages into strips, which are laid down, over-lapping each other; the limb is then laid upon them and they are brought round it in order, and the ends crossed in front in a spiral fashion so as to produce the appearance of an 8 bandage. (See Fig. 41.)

Sometimes the plaster may be used as a mass moulded between two shaped bandages. This is, indeed, the original "Bavarian splint," a method now almost obsolete. These splints are usually made for cases of simple fracture of the leg, but are not confined to these injuries. Taking the leg as example: two pieces of flannel or stout canvas are cut out to a pattern, which can be accurately got by cutting open a stocking which would fit the patient, along the front of the leg and foot, and then spreading it out; or more roughly by making "a double" of No. 12 in Fig. 54. The pieces

of flannel or canvas are then laid one on top of the other and stitched down in the middle line. The limb being laid upon them, the piece next to the leg and foot is brought round these parts and fastened along the front with safety pins. The corners *only* of the outside piece are then brought up, and pinned or stitched to the corresponding corners of the inner one, so that there is a kind of bag open along the top, on each side of the leg and foot (Fig. 57).

The plaster is then quickly mixed in a basin and stirred with the hand until it is of the consistence of thick cream. It is then poured into the bag on either side, the stitching along the back of the leg of course preventing the plaster from going right round. When enough has been poured in, it is pressed and moulded in all directions by the hands so as to make an even layer of plaster, about a quarter of an inch thick, between the flannel or canvas sides. A roller may then be put on to complete the moulding while the plaster sets, which will take from half an hour to an hour. The splint is then taken off by unpinning the inner layer of the bag in front; there will then be found a kind of hinge behind, where the two layers were stitched together, enabling the sides to open. The case is now trimmed and lined, or simply put on over a flannel roller and secured with webbing straps.

FIG. 57.—*Bavarian Splint (semi-diagrammatic).*

Recently, the method of immediate splinting described by Mr. Croft, or some slight modification of it, has come into very general use, as it has all the advantages of the Bavarian splint in the way of being able to be opened for inspection of the limb, and is yet much simpler. Each splint (for the leg two will be required)

consists of two layers of house flannel. The inner layer, which is generally moistened with warm water, is applied to the limb, while the outer one is thoroughly soaked in plaster of Paris cream and put on over it. Both layers are then applied to the limb while the surgeon holds it in position. *Muslin* bandages are then rolled on so as to thoroughly shape the splints and to bind them together. The turns of the bandage adhere to the plaster, but as the interval between the splint pieces is spanned by the muslin only, this can be cut up for examination of the limb along the upper interval, while it serves as a hinge at the lower. In the case of the leg, the pattern for the pieces of flannel, as in the case of the Bavarian splint, can be got from the flattened out stocking of the patient. Inside and outside splints will here be required, and they must be cut of such a size that they will not meet in front or behind for about half-an-inch. This plan of splinting can be adopted in many different forms of injury, and in various parts of the body.

The plaster in this and all other cases must be very dry; it is therefore a wise precaution to have it put into an oven for an hour before it is wanted.

The *Silicate case* is made with ordinary bandages and a saturated solution of silicate of soda, or potash, with or without the addition of a little chalk or whiting; it is applied in precisely the same way as the gum and chalk one, so that one description will do for both. In their mechanical properties also, the two cases are very similar. The silicate is slightly heavier, and perhaps not quite so durable: on the other hand it sets more quickly, taking from three to four hours, while the gum and chalk takes from twelve to eighteen.

Gum and chalk. A sufficient quantity of dry powdered chalk, free from lumps, is mixed in a basin with mucilage, until it is of the consistence of gruel. The limb being first bandaged with flannel (and in the case of the leg or thigh, the foot fixed at right angles with the heel elevated on a block), is carefully bandaged with a common calico roller, the flannel roller extend-

ing beyond it for about half an inch. The mixture is then rubbed into the bandage with the hands, so as to permeate it thoroughly. Another bandage is then put on and treated in the same way, and generally a third will be found necessary. The case is then left to dry.

The advantages of a well made gum and chalk case are many. It is lighter when dry than plaster of Paris, and though abundantly strong, has a certain flexibility which prevents its cracking. On the other hand it requires more time and patience in application, and the length of time it takes to set is sometimes inconvenient. It is, however, generally preferred by those who are accustomed to put it on.

The Stearine case is very clean and very rigid, but it is liable to crack. It is most suitable for limbs which require to be fixed upon splints for some length of time while the patients are confined to bed, or at least have not to move much. Thus, it is a very good way of fixing the leg and thigh on to the splint in cases of resection of the knee. The paraffin is cut up into small chips and heated in a vessel placed in a saucepan full of boiling water, for the wax itself should not be heated above 212° F. Gauze bandages, similar to those used in antiseptic dressings, are then immersed in the melted wax. The paraffin takes about two minutes to thoroughly penetrate to the centre of the roller. The bandages must then be applied to the limb over a flannel bandage while they are as hot as the operator's hands can bear.

Starch is the least efficient material for making a supporting case, but, on the other hand, it is one which is always ready to every one's hand.

It is applied like gum and chalk, by rubbing starch paste into the interstices of ordinary bandages. Four, or even five thicknesses will be required for any useful degree of support. The limb must be kept very still *while the case is drying.*

It may be here mentioned that a common roller bandage (e.g., one used for securing fracture splints)

has a more neat appearance, and is less liable to be disturbed if a little thin starch paste is brushed or rubbed over it after it has been put on.

Its chief drawback is the shrinkage which occurs as the splint dries on the limb, which is not present when other materials are used. This may even produce gangrene, and must prove a source of anxiety, necessitating careful observation of the circulation until the splint is dry.

Plaster of Paris, or gum and chalk spica bandages are very frequently used in early or convalescent cases of hip disease, or in fractures about the neck of the femur. They are applied like the ordinary spica, but require rather a firmer and longer hold on the thigh. That part of the bandage which goes round the pelvis does not require to be so much stiffened as the rest.

It is often necessary to apply a stiff bandage or case to some part where there is a wound. If the discharge from this be extremely small, it will be sufficient to cover it with dry gauze; but if not, an opening or "trap-door" must be made. This is best done with a very sharp knife after the splint is firmly set, a careful note being taken at the time of application as to the exact position of the wound.

It will happen, every now and again, that through chafing, or some other cause, a sore develops underneath one of these splints. In such a case no time must be lost in cutting away the chafing part. This may be sufficient, but very often the whole splint will have to be removed, and the sore allowed to heal. It is, therefore, very evident that every care must be taken, while applying the case, to avoid creases or constrictions in the bandages, which may lead to such serious consequences. Another common act of carelessness which may lead to the above result is that of leaving pins within the folds of the bandage.

When plaster or gum and chalk cases have to be removed, a pair of strong cutting pliers (Scutin's) may be used, or an instrument devised by Mr. Davy, which is a combination of a knife and a saw, and which is

very suitable for the purpose, if the splint is to be cut up along the middle line without other damage so that it may be used again. In other cases a strong jack knife will do, and, on the other hand, if the limb be very tender, it may be best to soak it and the splint in water until the plaster or chalk is sufficiently softened to allow of the layers of bandage being peeled off.

Of the application of the Plaster of Paris Jacket.—The "jacket" is to be considered as a *splint for the trunk*, fitting it so that the spine (especially at the seat of disease) is immobilised, and much of the weight of the body above the diseased vertebræ is taken off them and borne directly by the pelvis.

As will be seen, the method of application as advocated by Dr. L. Sayres in 1877 has been modified by several surgeons in one direction or another, but for most cases it is still the readiest and best way of getting an accurate fit.

The apparatus required consists of an overhead system of multiplying pulleys suspended by a hook from the ceiling or from a tripod 7 or 8 feet high. From the lower pulley hangs an iron crossbar, which carries padded loops (through which the arms are passed up to the shoulders), and an arrangement for the support of the head by the chin and occiput. These are all adjustable.

The patient must now be stripped, and a specially made woven cinglet or jersey put on.* These are made in various sizes, the one to be chosen being that which is long enough to enable the back and front to be pinned together between the legs, while it fits the trunk without any loose wrinkles. The jerseys are made without sleeves, but have shoulder tags which must be stitched or tied together.

But before this is done it will generally be necessary to make provision for the protection of the angular projection at the seat of disease, and sometimes of *other bony* prominences, by means of pads. In cases

* *These can be procured from any instrument maker.*

of early disease with little deformity and good nutrition, these may well be dispensed with, but when they are required they must be adjusted with great care, for much of the after success will depend on their

FIG. 58.—*Partial suspension for application of Jacket.*

being properly placed. For the angular deformity, the best plan is to adjust two firm cushions of tow, covered with *old* table linen, one on each side of the *projecting* deformity, and of such a thickness that it,

itself uncovered, does not come to the surface between them. When adjusted they are best kept in place by a few stitches through the jersey.

The prominences of the iliac spines may also require protection, but it is well to avoid this if possible, for it interferes with an absolute fitting. Provision should be made for the expansion of the abdomen that takes place after a meal by placing a folded towel beneath the jersey over the abdomen. This should be withdrawn when the plaster sets.

Six or eight 2-inch bandages made of crinoline muslin, into the interstices of which dry plaster of Paris has been thickly rubbed, some dry plaster in a bowl, and a washhand basin full of warm water, complete the requirements. The plaster and bandages should be placed in the oven for an hour or two before use. The room should have a fire in it, and a mattress should be laid on the floor in front of the fire. The slings are now to be adjusted for the head and armpits so that there is an even pull upon the head and shoulders when the extension is made by the pulley cord. In most cases the patient had better stand underneath the centre of the tripod as shown in the figure (Fig. 58), and be raised until the toes just remain touching the ground. If there be any paralysis, or great weakness, it is best for the patient to sit on a stool without a back, like a music stool; extension should then be made until the patient is almost, but not quite, lifted off the seat. He (or she) should never be swung clear of the ground; it is always useless, and sometimes dangerous.

One of the muslin rollers, charged with plaster, is then dipped in the water for a few seconds, so that it is wetted right through (it must therefore have been loosely rolled). The surgeon then applies it to the trunk, starting anywhere, and allowing the roller to take very much its own course, provided that the *jersey is eventually* uniformly enveloped from well *below the pelvic brim* up to the armpits. The turns *of the bandage should* take rather the form of loops

of 8 than that of horizontal circles. When the first bandage is about two thirds put on, a second should be put in to soak, and so on, until from six to eight bandages of three-and-a-half yards have been used.

While the surgeon rolls on the bandage, his assistant should take loose plaster in his hands, and, moistening it by dipping them in the water, rub it into the jacket everywhere.

If the rollers have been rightly applied there should be no need of any subsequent moulding about the pelvis or elsewhere, and it is much better to leave the case to set without interference, but if any alteration of shape should be called for, it must be made before the plaster sets.

The time which the plaster will take to set varies with the state of the atmosphere, the condition of the plaster, etc.; but speaking generally the child will be able to be safely released from the slings in about five minutes, and must then be very gently laid down on the mattress, near the fire, and must remain there for an hour or two, or until the jacket is thoroughly hard. Any trimming which may be required (under the arm-pits some is sure to be) can then be done with a sharp knife.

FIG. 59.—*Plaster Jacket applied.*

Fig. 59 illustrates the appearance of a jacket applied to a case of commencing caries in the way above described.

Modifications of foregoing method:—

(1.) It is often convenient to make arrangements for *shifting the flannel* jersey without cutting or removing *the case.* This may be done by putting on two at the

time of first application, one over the other, the necessary pads being fastened to the outer one, to which the plaster bandages will adhere, and which therefore cannot itself be shifted. The one next to the skin can, however, be easily pulled up over the head, and by its removal can be made to pull up a clean one from below, the upper end of which has been fastened to the skirt of the soiled one. In other cases a front and back slip of calico may be placed beneath the jersey before the jacket is applied, and these may be changed in the way just described.

(2.) In many cases the slinging up of the body by the head and shoulders is unnecessary, and all the good effects of position can be attained by making the patient grasp a crossbar (*e.g.*, a trapeze bar) placed at such a height that it can just be reached standing tiptoe.*

Infants and small children, again, should never be slung up; it frightens them too much, and quite as effectual an extension can be secured by making an assistant hold the child up by grasping the arms at the armpits, and raising the child until its toes only touch the ground, the chest walls being thus maintained in the inspiratory position.

(3.) The jacket may be put on while the patient is lying down flat, or better still while extended on an inclined plane, with the hands raised backwards above the head and grasping a bar. This is known as "Walker's Method."

To carry out this plan it is necessary to retard the setting of the plaster. This is effected by soaking the muslin bandages, into the interstices of which the plaster has been rubbed in the ordinary way, in a mixture of mucilage and water (about one ounce to a pint of water). When the roller bandages have been thoroughly moistened, they are cut into lengths sufficient to go round the body of the patient and to

* *Concerning the whole question of suspension I may say that I find that year by year I am less and less inclined to employ the pulleys and slings, and more often use the simple overhead cross-bar.*

overlap some inches in front. The several lengths are then arranged on the inclined plane so as to form a series of overlapping strips, in sufficient number to secure a three- or four-fold thickness everywhere.

The cinglet having been put on, and the pad adjusted, the patient is placed in the extended position over the strips of bandage, which are then taken up, one by one, and their ends crossed over the front of the chest and abdomen, like one loop and a bit of a figure of 8. If they have been properly placed it will be found that in this manner a well-fitting jacket, of a somewhat hour-glass shape, will be made, expanding above for the upper part of the thorax, and below to take hold of the pelvis.

The patient should be allowed to lie still until the case sets, which it will do in three or four hours.

The time occupied in the actual application of this jacket will generally be a good deal less than in the case of the ordinary one, but even if this were not so, the saving of fatigue and the other advantages incident on the doing away of the necessity for suspension, are sufficient to make this plan a very valuable one in many cases.

If there be any ulceration, or any discharging sinus opening at a place which would normally be covered by the jacket, it will very rarely indeed be wise to apply one at all; but if one is put on, a trap-door must be cut out after the jacket is set (the right place having been carefully noted), and great care must be taken to prevent any discharge soaking into the plaster.

Of the Application of the Felt Jacket.

Poroplastic Jackets.

The moulding of *resinous felt* into a spinal jacket does not differ in its main principles from the moulding of that material for other splints, but the large amount of felt employed, together with the great rapidity with which it sets, makes a certain amount of *practice necessary* in order to be able to fit a case *of spinal curvature* properly.

A well-fitted poroplastic jacket is often an admirable method of treatment. It is not much more than half the weight of a plaster one, is porous, so that the action of the skin is but little interfered with, and it can be removed altogether, or widely loosened, at frequent intervals, for the purposes of cleanliness, although it will not long stand being taken off every night, as is sometimes advised.

These jackets are sold in all sizes, roughly blocked out to a tailor's or corset maker's idea of the shape of the human trunk (Fig. 60).

For female patients over thirteen years of age, it is generally wise to have the parts of the jacket which correspond to the breasts and to the anterior iliac spines left unstiffened. In lads, and in children of either sex, this is not necessary; but if the angular projection be very sharp, it is often wise to have an unstiffened patch left at the spot where it will come. This should not be done as a matter of routine, however; for the existence of this island of softness does, more or less, weaken the jacket as a whole, and it is often better to protect the prominent spine with pads.

FIG. 60.—*Felt Jacket.*

If the jackets are supplied ready fitted with the straps, buckles, etc., these should be cut off before the moulding is commenced; they can easily be sewn on again, and their presence during the moulding is an embarrassment.

Felt jackets, when employed in the slighter or in the incipient stages of caries, can perfectly well be *moulded straight*way on to the body of the patient; *but in all cases of* severe deformity, or whenever there *is distress or pain* on handling or movement, it will be

necessary to do the actual moulding on some cast or model. It will therefore be best to describe the manipulations for these two classes of cases separately.

I.—*Moulding on to the body of the patient.*

This plan is the best to adopt in the slighter cases. The apparatus required is a steam-chamber of a cylindrical form, which can be got at any instrument maker's. It has a sliding adjustable top, and a false bottom, beneath which there is placed a flat pan containing about a pint of water, from which steam is generated by a spirit lamp or dish placed under the cylinder. Care must be taken that the water does not come above the level of the perforated false bottom, or part of the jacket will be wetted and the patient will be scalded.

The jacket is placed in the cylinder, the top shut down, and the spirit lighted; in about five minutes it will be sufficiently soft to mould.

In the meantime the patient must be prepared by the adjustment of the jersey, pads, etc., just as in the case of the plaster jacket, and arrangements must be made for extension, either by the tripod, the trapeze, or the simple inclined plane, as before described.

For most cases the standing or sitting position with the tripod and slings, or with the arms raised to a trapeze will be found best, but in whatever way the jacket is fitted, the necessity of quickness is a most important point to bear in mind.

II.—*Moulding from a cast.*

When the whole trunk has assumed a thoroughly distorted position, it becomes plainly impossible to mould the jacket upon the living body, and the necessity for making some cast or model of the trunk upon which it may be blocked becomes apparent.

By far the readiest way to get the model of the trunk of a patient is to put on a light plaster of Paris case; as soon as it is set it must be carefully cut down *the centre in front* with a very sharp knife, care being *taken to keep* the edges clean cut. The cingulet must

then be peeled off its inner surface, and the case carefully taken off the patient.

FIG. 61.—*Case of Angular Curvature wearing a jacket.*

The next steps consist in joining up the cut in front *by passing a roller* bandage, or long strips of strapping *round the case,* and then thoroughly larding the

whole of the inside, and the outside at the bottom for about one inch.

The case is now ready to be used as a mould for the solid cast, and all that is necessary is to make a "foundation" for the cast by spreading a layer of plaster of Paris, mixed so that it is just setting, upon some suitable board, and then to settle the lower edge of the jacket into it, to the depth of about half an inch. When this is set, freshly mixed plaster cream may be poured into it, as into a bucket, and after solidification has taken place the case may be removed.

Having thus procured an insensate and hard cast upon which to work, instead of the soft and tender body, it is obvious that not only can more force be applied to urge the felt to follow the curves of the deformity, but that it may be applied when it is in its most pliable condition, which is attained when it is hotter than could well be borne by any patient. Fig. 61 represents a patient with well marked angular curvature, wearing a jacket which has been thus moulded.

Lastly, although these jackets have been spoken of as being moulded from ones previously roughly blocked out and sold in that form, and allowing that these are generally the best to use, still it is well to mention that they can be made from the felt bought in sheets, and when so made are somewhat cheaper.

If a plaster cast be used, nothing further is required than to cut a piece of felt of rather more than the extreme height and circumference of the jacket required, to roll it into a cylinder (softening it, if necessary, with hot water) and then thoroughly soften it in the steam chamber. If it is required to mould a jacket from the sheet to the body itself, it must first be blocked and roughly shaped.

The drawback to making jackets from the sheet felt *is, that they* cannot be made soft subsequently over *the hips and* breasts; the advantage is the saving in

expense, and the softening is, in the case of children especially, very frequently not called for.

The jacket having been moulded and trimmed to its right shape, two strips of leather, with eyelet-holes punched for the passage of stay laces, must be sewn on in front, one on either side of the opening, and to these it is also wise to attach three pairs of webbing straps and buckles—one at the waist, one above, and one below.

SECTION II.

OF THE SIMPLER WAYS OF DRESSING WOUNDS, BURNS AND SCALDS.

CHAPTER IV.

Of the Dressing and Suturing of Wounds.

The principles underlying the treatment of wounds, depend upon the fact that all infection is the result of the accidental introduction into the wound of those micro-organisms that are specially harmful to the human being. To ensure success in healing, therefore, it is necessary to provide against contamination of the wound with noxious materials. It will simplify matters if we consider shortly the paths by which germs gain access to the injured tissues. For it is only by an accurate acquaintance with the modes of entry of organisms, that we can successfully guard against them. There are three ways by which the wound may be infected, through the blood current, by exposure to the air, and by direct introduction from hands, instruments and materials coming into contact with the tissues.

The comparative unimportance of the blood current as a conveyer of infective material, is shewn by the freedom from suppuration of those injuries, such as simple fractures, in which the skin is unbroken. This mode of contamination may therefore be neglected.

Arguing from the favourable course run by subcutaneous injuries, it was until recently held that exposure to the air was the cause of most of the accidents due to wound infection. These complications were considered to be due to the decomposition of the blood in the damaged tissues set up by organisms falling *into the* wound from the air.

The first attempts at the antiseptic treatment of

wounds were directed towards preventing this contamination by creating an atmosphere free from germs, and by destroying such organisms as might have reached the wound in spite of the precautions taken. More recent investigations have shown that the dangers of infection from the atmosphere were overrated. As a matter of fact, the organisms capable of giving rise to wound infection, exist in the air in an exceedingly small number, which, as compared with the numbers that can be introduced in other ways, is infinitely small. Consequently, experience has taught us to lay less stress on infection by the air, and more on that by direct contact.

In the great majority of cases in which suppuration or other infective processes have been accidentally set up, these are due to the direct introduction of organisms into the wound by the hands, instruments and materials that have come into contact with it. It is on the recognition of this simple fact that the treatment of wounds now depends. It is not now a question so much of killing such organisms as have managed to find their way into the wound, as of preventing their entry, and this can only be done by the most minute attention to every detail that enters into any operative procedure.

To avoid accidental infection through exposure of a wound to the air, care should be taken that no dust is raised immediately before the operation. The atmosphere will be found to be practically free from organisms if the dust is allowed to settle by closing the operating room for two or three hours beforehand. The stirring up of germ-laden dust will be less likely to occur during the operation, if the surface of the room be damp. This, however, is only possible in specially constructed theatres. The handling of dressings containing dried discharge should be especially avoided.

For a wound to heal well the following conditions must be fulfilled.

(1) The wound must be cleansed and kept clean.

(2) All bleeding must be carefully arrested before *the closure of the* wound.

(3) Means must be taken to allow of the ready escape of all wound secretions.
(4) The divided tissues must be brought into close apposition and there retained.
(5) The parts must be kept at rest.
(6) The wound must be protected by some dressing material.

1. *The cleansing of the wound.*

The means to be adopted will differ according to the condition of the wound.

There are two main classes into which wounds may be divided from the practical point of treatment—the wound made deliberately by the surgeon for a definite purpose, in tissues free from organisms, and the wound, either accidentally inflicted or made in tissues which are already the site of an infective process.

In the first case, all our endeavours will be directed towards keeping the wound aseptic throughout; in the second, in converting a wound already contaminated, into one free from infective material.

(A) *Accidental Wounds.* In the treatment of wounds accidentally caused, it should be borne in mind that much harm may be caused by careless examination with dirty hands and instruments. That the wound is not, to begin with, perfectly clean is no excuse for introducing more dirt. If infection has not already taken place, we may, by injudicious exploration with a dirty finger or probe, render this inevitable. Secondly, the habit of washing a wound with water from any source at hand must be carefully avoided. Incalculable harm may be done, whilst no good whatever can result from the proceeding. In emergency cases, therefore, attention should be directed at first, solely to the staunching of bleeding, leaving any necessary cleansing measures till means are at hand for their performance, according to recognized surgical principles. In the majority of cases, bleeding is controlled by firm, even bandaging over some dressing material. Where this is insufficient, resource must be had to some of the methods given

in the chapter on Hæmorrhage. Resource should not be had unnecessarily to styptics. The bleeding that these applications will stop can almost always be readily controlled by pressure.

For an emergency dressing, nothing answers better than clean linen recently washed and ironed, or else boiled for five minutes, and then wrung out and applied to the wound.

Means being at hand, the wound must be thoroughly cleansed, and for ordinary cases the thoroughness with which the washing is performed is more important than the fluid which is employed. A lotion of carbolic acid (1 in 20 to 1 in 40) or of perchloride of mercury (1 in 1000 to 1 in 2000) is commonly employed. All bleeding having been completely arrested, the wound is sewn up. If, however, there remains any doubt about the efficacy of the cleansing process, it will be found advisable to pack the wound temporarily with iodoform gauze. This being subsequently removed (within 48 hours) the wound, if still aseptic, is treated as a recent one, and the edges brought together with sutures.

(B) *The treatment of operation wounds.* Here we have to deal with wounds made deliberately into aseptic tissues, and our object is to prevent the introduction of pathogenic organisms by strict attention to everything that will come into contact with the wound. This involves the cleansing of the patient's skin, the surgeon's and assistant's hands, the instruments, sponges and ligatures used.

First and foremost in the cleansing of the skin, is the thorough use of soap and water, and to this alone many surgeons confine themselves.

In Von Bergmann's clinic * the hands are cleansed as follows. The skin is scrubbed with soap and water

* "The Aseptic Treatment of Wounds," by Dr. C *Schimmelbusch*, translated by A. T. Rake, F.R.C.S.

For further details of the aseptic treatment of wounds, we *would refer our readers to* the above well known work, to which *we are indebted for much in* this chapter.

as hot as possible, for at least a minute, special attention being paid to the nails and folds of the skin, which are cleansed with nail brushes kept in sublimate solution. Having been dried in sterilized towels, they are rubbed with 80 per cent. alcohol on sterilized gauze, again washed, rubbed with towels and 1 in 2000 sublimate solution.

The skin of the patient having been previously thoroughly washed, is shaved widely around the site of the wound, which removes not only hairs, but superficial layers of epidermis. It is then scrubbed with soap and water, and washed with alcohol and sublimate solution.

Instruments are rendered sterile by boiling for five minutes in a 1 per cent. solution of carbonate of soda (ordinary washing soda). During the operation they may be kept in a cold soda solution, or in carbolic acid lotion (1 in 40) or in a solution of carbolic and soda, 1 per cent. of each. By the addition of soda to the water, the rusting of the instruments, that will occur if they are boiled in water alone, is prevented. The strength recommended (1 per cent.) corresponds very closely to that employed in laundries. Its germicidal properties have been shewn to be very great. All that is needed for the sterilization of instruments is a flat tin or copper vessel, with a wire basket in which they can be removed. In boiling knives, it will be found advisable to wrap the blades round with a piece of gauze, to prevent the edge from chipping during the ebullition of the fluid.

The patient's skin having been thoroughly cleansed, the field of operation is surrounded with sterilized towels. It may be borne in mind, that these, if recently washed and ironed, are practically sterile. To guard, however, against any possibility of infection from them, they should either be sterilized just before use, or should be allowed to soak in some antiseptic solution, such as 1 in 40 carbolic, for some hours *beforehand*. By this means, contamination of *the wound from* bed clothes, mackintoshes and

uncleansed portions of the patient's body is avoided. If a limb is to be operated upon, it should be carefully bandaged from the hand or foot upwards as far as the operation site, with a bandage wrung out of carbolic or perchloride lotion. To prevent any possible danger from the clothing worn by the operator and his assistants, overalls should be worn, made of some material, such as linen, which can be readily washed and sterilized.

During the operation two methods of procedure are in vogue. In the one, the wound is from time to time irrigated with some antiseptic lotion, such as carbolic or sublimate solution. In the second, the so-called "dry" method, this is dispensed with. No fluid at all is used to the wound, which is kept free from blood by aseptic sponges. This mode of treatment, which is coming into general use, is based on the following principles. Infection from exposure to the air has been shown to be so slight a risk, as to be with moderate precautions as to the stirring up of dust, a negligable quantity; on account of the precautions taken, the danger of infection by contact is reduced to a minimum; even if organisms do enter the wound, irrigation is as likely as not to drive them further into the tissues; the germicidal powers of the fluids used is overrated, and whatever possible action they might have in this respect, is more than counterbalanced by the harm they do in lessening the vitality of the tissues.

In keeping the wound dry in the course of operation, sponges would be the most admirable material for the purpose, were it not for the difficulties of cleaning them. For this reason other material is largely made use of, and nothing answers the purpose better than pads made of absorbent gauze. On account, however, of their expense, it is usual to make use of some other absorbent material such as cotton wool, covering it with a layer of gauze to prevent the adhesion of loose particles to the tissues. These pads must be sterilized before use.

If sponges are used, Schimmelbusch recommends the following process for their sterilization. After they have been used, they are cleansed by energetic washing, first in cold and then in warm water. A solution of one per cent washing soda in water is then boiled and taken off the fire. Into this hot fluid the sponges, previously squeezed out and tied up in a linen bag, are immersed. The sponges must not be boiled, as they shrivel up if so treated. They are left in the hot solution for half an hour, taken out, wrung out in boiled water and placed in 1 in 2000 sublimate solution till required for use.

2. *All bleeding must be carefully arrested.*

Great stress should be laid on the stoppage of all bleeding before the wound is closed. Nothing is more likely to conduce to wound infection than the presence of pent-up blood and secretions. The wound should be made as dry as possible before the sutures are inserted.

3. *Arrangements must be made for the ready escape of all wound exudations.*

The means to be adopted to secure the fulfilment of these conditions include the different ways in which a wound may be drained. There will be in all cases some fluid exudation whether a wound has been closed before the bleeding has stopped or no, and provision must be made for its escape, except in wounds which are at once small and perfectly healthy. It is difficult to make any dogmatic statements with regard to drainage, but it may be taken as a rule that drainage may *safely* be dispensed with only when by accurate apposition of wound surfaces by sutures and the pressure of dressings, no retention of discharges is possible. Drainage is largely dispensed with by many surgeons, but only at the expense of a slightly added risk. When there is any doubt it should be borne in mind how little a drainage tube delays the healing of a wound.

As the *whole* object of a drain is to prevent fluid remaining within a wound, no exception should be

made to the rule that all cavities are to be drained from the bottom. The place of exit should, therefore, be the most dependent part of the wound, unless, as is often advisable, a separate aperture is made for the tube alone. The materials made use of for drainage are india-rubber tubing of different sizes, glass or metal tubes, horse-hair, catgut or silk drains, and absorbable decalcified bone tubes. These absorbable tubes have, however, been found unreliable, either being absorbed too soon, or remaining unabsorbed for long periods. It is preferable to make use of tubes that are not absorbable, and of these india-rubber tubing is the most generally useful. It may be rendered sterile by boiling for five minutes in soda solution (1 p. c.), and should be kept ready for use in a 1 in 20 carbolic acid solution. The possibility of the tube slipping into the wound should be borne in mind. This may be guarded against by sewing a loop of silk to the tube, and drawing through the loop a piece of gauze, or by passing through the end of the tube a safety pin that has been sterilized by boiling.

It is difficult to lay down any rules for the removal of drainage tubes, the practice of surgeons varying widely in this respect. Some surgeons remove them within twenty-four to forty-eight hours without disturbing the deeper parts of the dressing, which are not changed for a week or so. Others, however, prefer to remove them at the end of a week, at the time of the first dressing. Whatever plan is adopted the drain should be removed entirely and not shortened day by day in wounds that are aseptic. The track left by the tube closes over in the course of another two or three days.

4. *The adjustment and closure of the wound.*

(A) *Of its deeper parts.* With the exception of the parts which are necessarily separated by the presence of drainage tubes, the adjustment and replacement of *the divided* tissues must be carried out throughout the *whole extent of* the wound, and, if possible, as perfectly *in its deeper* parts as on the skin surface; for

upon this the manner of healing, as well as the appearance when whole, will greatly depend. But the means at our disposal for keeping the deeper parts together after replacing them, are somewhat imperfect. In most cases the support and pressure afforded by pads and bandages put on outside the wound are trusted to keep the sides together, and if these will suffice, so much the better. But in many instances, and especially in plastic operations, it is necessary to fix the parts more securely, either by sutures, passed far below the surface (deep sutures), or by needles or hare-lip pins passed at a similar depth.

Deep Sutures. If the depths of the wound have to be kept together in this way, it must be because there is a tendency for the parts to separate. There will, therefore, be *tension* on the sutures, and unless some precautions are taken they will speedily cut out. All the contrivances which have been devised to prevent this, have for their object that the sutures shall pull upon an area of skin at the margin of the wound, which is shielded in some way from the direct pressure of the wire or thread. For this purpose the suture, which is passed through the wound at the depth desired, enters and emerges from the skin at a little distance from its edge, and is then fastened to a piece of quill or catheter, or passed through a piece of india-rubber

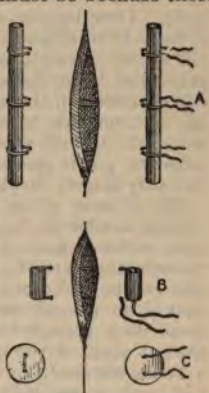


FIG. 62.—*Illustration of some forms of Deep Suture.**

* (A) *Quilled Suture.* The deep stitches of silk or silkworm gut are tied round pieces of gum-elastic catheter. (B) The skin is protected by passing the silk at either end through a piece of *india-rubber tubing*, ⅛ to ½ inch in length. (C) Button Suture.

tubing, or piece of sheet lead or zinc, cut to the requisite size, or shaped as a stud or button. The illustration (Fig. 62) will show without further words the general principle of these fastenings, of which the details may be modified in many ways.

Hare-lip pins are steel pins which may be passed across the depth of a wound, entering the skin a little away from the edge on one side, and coming out at a corresponding distance on the other. Silk is twisted over the protruding ends, so as to bring not only the deeper parts, but the skin surfaces into apposition. The point and head of the pin are then nipped off with a pair of cutting pliers, made for the purpose. Two little bits of lint should be put underneath the ends. Hare-lip pins are generally removed at the end of from 24 to 48 hours; they must not be *with*drawn, but drawn *through*, by seizing the end off which the point has been nipped, and making steady traction with rotation in the axis of the pin, but without working it from side to side. For deep sutures silk, silkworm gut and silver wire are made use of. Of these silkworm gut is probably the best for the purpose. It has very largely displaced silver wire.

(B) *Closure of the lips of the wound.* Superficial sutures are for the accurate adjustment of the divided skin surface, and of the tissues near it; in most wounds they are the only ones required. No strict rule can be laid down as to the depth at which they should be passed, but it is often convenient to put them deep enough to arrest bleeding from vessels in the cut edges of the wound.

Wire, silvered, or of silver, silk, catgut, silkworm gut, and occasionally horsehair, are the materials chiefly used for sutures. Of these general preference must be given to silk.

Two varieties of superficial suture are used—the continuous and the interrupted. In the interrupted *each point is* secured separately, by twisting, if it be *of wire, or by tying* in reef knots in other cases. Thin *wire may also* often be tied. In any case, the twist

or knot should be at one side, and not over the line of the wound (Fig. 62). The actual skin surfaces should, if possible, be brought together exactly, but it is better that the edges should be a little everted than inverted. A little inversion is often overlooked at the time of adjustment, and the result is an unsightly depression.

The number of sutures must be just as many as will close the wound throughout; fewer will not do, and more are needless foreign bodies. So long as stitches are not doing harm, there is no limit to the time they may be kept in, but as soon as there is any tension, or area of inflammation around them, they are better away, lest they should be retaining discharges.

Silk sutures require only to be snipped and removed with forceps, but wire ones should always have the little hook which will be found at the end which is to be pulled through the wound, carefully straightened out or cut off. No more needless pain can well be inflicted than that caused by neglect of this small precaution.

Adhesive strapping may be used to relieve tension which would otherwise be borne by the sutures alone, or may be the sole means employed to close a wound. In either case care must be taken to avoid puckering, and the best way to do this is by cutting the strips as shown in Fig. 40. The widely diffused support of the plaster is extremely useful, but no wound, except very small and clean cuts, should ever be completely closed over with strapping; a drop of pus thus shut in may work very great mischief. As a matter of fact, the use of strapping in aseptic surgery is limited on account of the difficulty of rendering it sterile.

There only remains to be mentioned a mode of closing small wounds, especially about the face, by *collodion*; the ordinary, or the flexible kind may be painted over the wound or applied upon a piece of gauze, and by its contraction a close apposition may frequently be attained.

5. *Arrangements for rest, i.e.*, for retaining the wound surfaces in apposition. It is not necessary to enlarge on the importance of this point. It will be understood that a wound can hardly heal unless it be kept at rest, and also that the means of securing this rest must vary with every case.

6. *The wound must be protected by some dressing.* The term *Surgical Dressings* is used to express the materials and medicaments which are put over a wound to cover and to protect it, and to forward its healing. These may be conveniently divided into *dry*, *watery*, and *oily* dressings.

The medications used may have for their purpose the prevention of decomposition, or the maintenance of simple cleanliness, or some stimulation of the wound; or a cool, a warm, or a moist atmosphere may be desired, or simple greasiness of the surface. But whatever be the nature of the dressing, it must, before all, fulfil the indications of cleanliness, and absorption of the discharges.

Just as in former times it was believed that a simple fracture could not unite, unless healing salves of various kinds were applied to the skin, so even up to the present day, many seem to find it difficult to remember, that the nature of wounds is to heal, and that nothing applied to a wound can of itself heal it, though many things can be done to retard or prevent the healing process. In fact, the results now desired are almost absolutely negative ones, such as the avoidance of movement, of irritation, or of tension, the removal of discharges, and the like.

But, in most cases some kind of application will be required, and the nature of the dressing does in many cases affect the course of the repair. Thus, granulations will often become large and flabby under carbolic oil, and again, small and prone to bleed under the use of chloride of zinc. A choice, therefore, has to be exercised, but experience alone will give the power of *judicious selection.*

For the purposes of description, some classification *of wound dressings* must be adopted, and the following

may probably be found convenient. We shall first divide them into dry, watery, and oily dressings, and then arrange the drugs and materials used under each head, according as to whether they are chosen because they are non-irritant, anodyne, antiseptic, or stimulating.

Dry dressings. We may consider under this heading healing by scabbing. In an atmosphere free from dust, even large amputation wounds will heal well if they are simply exposed to the air, with no dressing whatever upon them. The effused blood and lymph form a crust, under which repair progresses, and if care be taken that no discharges are retained, the results of this almost absolute neglect of the wound are very good, especially in the country, as in cottage hospitals. Except, however, for very trifling wounds this method of treatment is practically obsolete. There is always danger of dust being stirred up in the neighbourhood of the wound; and the risk of contact with infective material cannot with certainty be guarded against.

To avoid these dangers, protection is afforded to the wound by some form of covering, which in the majority of cases is dry. This dressing must effect three things. It must absorb the secretions of the wound thoroughly; be itself free from pathogenic germs; and act antiseptically so as to prevent decomposition of the secretions absorbed.

Many materials have been at different times made use of for absorbent dressings—gauze, cotton wool, wood wool, moss, sawdust, earth, ashes, etc. Of all these gauze is the most suitable material; experience has shewn it to be the best absorbent for the discharges from a wound. It answers this requirement also, that the material used should not only be readily absorbent but should allow of ready evaporation so that the wound discharges dry quickly. Other substances, such as blotting paper, which are readily *absorbent, are* useless from the fact that evaporation *from them is* very slow. Next to gauze, moss

(Sphagma Cymbifolia) is the best dressing. It has the advantage of cheapness and is soft, flexible and absorbs freely. In elasticity and in powers of absorption it is superior to cotton wool.

Whatever material is used, the dressing must itself be free from pathogenic organisms. Before use, therefore, it must be subjected to such treatment as will destroy any germs already contained in it. There are two ways of doing this—(1) impregnation by some antiseptic ; (2) sterilization by heat.

Although dressings can be absolutely sterilized by long impregnation with powerful antiseptics, they are liable to accumulate dust and dirt in subsequent manipulations of folding and cutting. This may be prevented by the use of heat for the sterilizing agent. The dressings having been cut out of plain gauze of the shape and size required, are submitted for thirty minutes to steam in some suitable form of apparatus. They may then be transferred straight from the sterilizer to the patient.

Dressings sterilized by heat in this way may, for want of the apparatus, be unattainable, or, on account of the character of the discharge from the wound, unsuitable. Some preparation of gauze is then used that has been impregnated with an antiseptic. The varieties in use are the following : carbolic gauze, salalembroth gauze (double chloride of mercury and ammonium), cyanide gauze (mercuro-zinc cyanide) and iodoform gauze. Of these, the last two are the best. Before use, the layer of cyanide gauze that is to be in contact with the skin should be washed for a short time in 1 in 40 carbolic lotion, to remove the sublimate it contains. The third important property of a dressing is that it should prevent the growth of organisms in the wound discharges that have soaked into it. This may be brought about in two ways, either by using dressings which are saturated with some antiseptic, *such as the various* forms of prepared gauze, or by *using dressings that*, by free evaporation, allow the *discharges to dry rapidly*. Reliance is entirely placed

upon this second method in the case of gauze sterilized by heat. In the one case growth is prevented by admixture with an antiseptic; in the second, one has to depend upon the drying up of the discharges to prevent decomposition. Nothing more effectually checks the growth of organisms than the drying up of the soil on which they ordinarily flourish. In most cases the aseptic method answers admirably. In cases, however, in which the discharge is very copious, or foul and thick, it will be found better to use an antiseptic gauze.

Wet dressings. This class of application is a very large one, and comprehends all lotions, tinctures, hot or cold compresses, and poultices; every dressing, in short, by means of which the surface of wounds may be kept moist. In the great majority of cases, the moistening fluid is applied by soaking pads or strips of lint in it.

Wet dressings are not very often used for recent aseptic wounds. As regards the simple water dressing covered with a piece of oiled silk, nothing could be better devised to favour the growth of organisms. In any case a watery dressing means frequent change, a manifest disadvantage.

Wet applications are, however, frequently used with advantage in the treatment of foul and septic wounds, or for the purpose of stimulating callous ulcers, or checking the too exuberant growth of granulations, or in the form of compresses to the skin before operation.

Of antiseptic lotions the following are the most commonly used.

Carbolic acid, used extensively for the disinfection of the skin, hands, instruments, towels, etc., before an operation, or for the cleansing of foul wounds. It is used generally of a strength of from 1 in 20 to 1 in 40. It is too irritating to be used as a dressing for any length of time in watery solution.

Corrosive sublimate $\frac{1}{1000} - \frac{1}{4000}$ used for the same purposes as carbolic acid. It acts, however, more quickly. *No* metal instruments must be allowed *to come in contact* with it.

Boracic acid, saturated solution. A very useful unirritating antiseptic, commonly employed for fomentations, baths and irrigation purposes.

For wounds with a copious discharge of foul pus, Schimmelbusch recommends as a dressing gauze wrung out of liquor aluminii acetici (1 per cent).

As *astringent applications* the lotions commonly used are those containing sulphate of zinc, sulphocarbolate of zinc, sulphate of copper, nitrate of silver, alum, or subacetate of lead. The indications for the use of these different solutions is beyond the scope of this article.

As an anodyne application opium may be used combined with subacetate of lead. This is an extremely useful application, and may be employed for many purposes, either hot or cold. As a hot application to inflammatory swellings, it will be found of great benefit. The following formula is from the Guy's Hospital Pharmacopœia: Extractum opii gr. ijss, liquor plumbi subacetatis dilutus ℥ss, water ℥ss.

Irrigation of a wound is now but seldom used. From the aseptic point of view it has many objections. The chief indication for its use would be a foul sloughing wound.

To set up an irrigation apparatus, all that is required is an arrangement by which a constant drip of water or of some lotion, can be made to fall upon the wound, as shown in Fig. 63. This may be done by suspending a vessel over the wound, properly fitted with a tap and india-rubber tubing, or the tube may be allowed to act as a syphon. In either case the difficulty is to get the drip to be sufficiently slow, and quite as good a plan is the simpler one of hanging one or two strips of lint from a vessel supported above the wound. The fluid is evenly distributed, drop by drop, by the strips, which act as syphons by the capillary attraction of their fibres. It will be necessary to put some pan or basin beneath the wounded part, and the bed must be kept dry with water-proofing; but

there is always some slopping, and the patient had better lie in blankets.

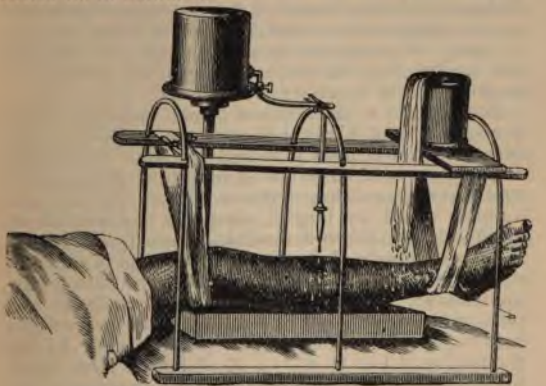


FIG. 63.—*Methods of Irrigation.*

Immersion in a bath, either of the whole patient or of the limb affected, is a method that presents many advantages over the preceding for sloughing wounds, cellulitis and allied conditions. Boracic acid is generally employed as the antiseptic. The immersion may be continuous, or may be kept up for an hour or two at a time, at frequent intervals.

A clean cut wound should never require a *poultice*, the special advantage of which is the relief the warmth and moisture afford in conditions of inflammatory tension. The different ways of making poultices are described in the following chapter.

The indications which call for a poultice may be met by wringing Boracic acid lint out of hot water, or plain lint out of a hot saturated solution of Boracic acid, and covering with gutta-percha tissue or *oiled silk*. To such an application the term a "*fomentation*" is applied.

Certain alcoholic tinctures, generally freely diluted, are in common use as wet dressings. Of these, Friar's Balsam (Tinctura Benzoinæ Co.) should be mentioned as an admirable stimulant for wounds which are slow to heal. It is applied by soaking pads, or strips of lint in the tincture, and is probably the best of the preparations of aromatic gum resins.

Coming now to the *oily and greasy dressings:* with the exception of burnt surfaces these applications are practically never used to recent wounds. They form, however, useful bland or stimulating dressings to ulcers and granulating surfaces. Olive oil, pure and simple, would be largely used, on account of its absolutely non-irritant qualities, were it not so apt to become rancid; but when carbolic acid is added to it, it forms an application which is universally appreciated. Carbolised oil usually contains one part of the acid to 40 of oil, but other proportions may be found more useful in special cases. In the proportion of 1 in 15 or 1 in 20, it lowers local sensibility without having the escharotic properties of the pure acid or its stronger solutions. It is generally used by soaking pads or strips of lint in it.

The oil of eucalyptus, thymol, or terebene may also be mixed with olive oil, and used in precisely the same way as the carbolised oil. They are all good dressings, although they have not yet been shown to be in any way superior to carbolic oil; any of them, the eucalyptus oil especially, may be used when carbolic acid is contra-indicated.

All these dressings, if continued for long are apt to make the granulations large and flabby; they should then be changed for some astringent lotion, such as a solution of the sulphate or chloride of zinc.

Castor oil is rarely applied externally, except in injuries to the eye, where its viscidity and blandness make it very useful.

Ointments of various kinds are largely employed as *dressings for skin affections*, ulcers, the granulating *surfaces of wounds*, and similar conditions. Some

are chosen for this purpose because they are non-irritant, as the ung. simplex, or ung. spermaceti, or because they have more or less stimulant properties, as the ung. zinci oxidi., or the ung. hydrarg. nitratis, diluted with an equal quantity of vaseline or lard.

Vaseline, though in no sense an oily material, may conveniently be classed with them. It is a clean and bland dressing, and serves also as a basis to which various drugs may be added, so that they can be applied as ointments. The fat extracted from sheep's wool, which has been named Lanolin, is largely used as an ointment basis for drugs, as it is believed to favour their absorption.

Speaking generally, ointments are most conveniently applied by spreading them on lint or on old linen.

CHAPTER V.

Of the Making of Poultices, Fomentations, Cupping, etc.

Poultices are applied in *surgical* cases when a superficial inflammation is to be allayed, the process of suppuration hastened, or when any wound or sore has assumed a sloughing or otherwise unhealthy character. For the latter purpose, however, they have almost entirely given way to antiseptic fomentations and other methods of treatment. In *medical* cases their useful action is less direct, inasmuch as they are mainly intended to reduce an inflammation of parts at a distance from the skin surface to which the heat and moisture are applied. But in all cases the immediate object to be served by putting on a poultice is to warm and moisten the tissues with which it is in contact. The manner of its action is partly mechanical, for by relaxing the tissues, pain and tension are reduced; and partly physiological, as it affects primarily the circulation of the part poulticed, and secondarily the tissues or organs at a distance.

A great variety of materials have been used at one time or another for making poultices, such as carrots, turnips, potatoes, etc., but we shall here consider the following only:—

1. Poultices of crushed linseed meal
2. ,, ,, ,, with charcoal
3. ,, ,, ,, with mustard flour
4. ,, oatmeal
5. ,, bread
6. ,, starch
7. ,, ,, with iodine (Marshall's)
8. ,, *bran*
9. ,, *yeast.*

The common *Linseed Meal poultice* is the one in the most general use, and is the easiest to make. The *crushed seed*, not the ground linseed flour should always be chosen, for the former still retains a good deal of oil which gives a surface to the poultice mass and prevents it from sticking to the skin.

All that is necessary to make a good linseed poultice is to see that the water is boiling to begin with, and to waste no time in the mixing. The general plan is to scald out a pudding basin, to put into it the linseed, and to add boiling water gradually, stirring the mass with a warm spoon; or, if it is preferred, the water may be put first in the basin and the meal gradually added; or again (and in this way all cooling of the poultice mass during mixing is avoided) a sufficient quantity of water may be kept boiling in a saucepan upon the fire, and the linseed gradually stirred into it. In any case, when the proper consistence has been reached, the contents of basin or saucepan should be emptied out upon a piece of old linen or cotton stuff, of the shape of, but a little larger every way than the poultice required, and quickly spread with a spatula, or large knife (an ivory paper knife does well), which must be kept well wetted with boiling water, until it is everywhere about ¼ inch thick. This spreading should have distributed the mass evenly over the stuff, up to about an inch of its edges; this inch must now be neatly turned over upon the margins of the poultice to which it will adhere.

Another good plan is to card out tow and fashion it into a bed for the poultice mass. The manipulation of the tow requires some practice, and can hardly be described in words, but it forms a very light non-conducting backing.

If the mean has been hit between sloppiness and dryness, the poultice should now be able to be folded up or handled freely without coming to pieces, and its surface should be smooth and non-adherent to the skin, *to which* it should be, when first made, still too *hot to be applied*.

If it be desired to keep a poultice hot for a little time before it is applied, or if it has to be carried for any distance, it is best to fold it up and place it between two hot plates.

Poultices should be applied as hot as they can be borne, and to get the full benefit of them, they should be changed at least every two hours, for, whatever they are made of, they soon get stiff and cold; as a rule, every three or four hours is considered to be the time for changing poultices, and in hospitals it is perhaps hardly possible that it should be otherwise. But under no circumstances should eight or ten hours be allowed to pass, for by that time the poultice will have become sour.

Of whatever kind the poultice may be, the surface of the mass must be placed upon the skin itself, without the intervention of any woven stuff, even of the thinnest muslin.

If oiled silk or oiled paper be placed over the back of the poultice it will retain its heat and moisture better.

All old poultices should be burned directly, never allowed to remain in a ward, or be thrown into a dustbin.

So-called aseptic poultices, made with Condy's fluid, carbolic lotion, sanitas or liquor carbonis detergens, instead of with water, have been practically superseded by fomentations and other antiseptic modes of treatment. The same thing may be said of charcoal poultices, which are made of three parts of linseed to one of charcoal in powder.

For counter irritation mustard flour may be added to the crushed linseed in varying proportions (generally equal parts of each), and the poultice made as before. These "mustard plasters" are largely used in domestic medicine, but they are often a useful stimulant in surgical cases, as in cold, or callous ulcers of the legs.

Such applications as iodoform, or opium in powder, *are sometimes dusted* upon the surfaces of poultices, *or laudanum, or* the tincture of belladonna, may be

sprinkled over them for anodyne purposes, but this is not generally considered a good way of administering such local remedies.

Oatmeal poultices are commonly used in Scotland, but more rarely in the south of England. They are somewhat heavier than linseed ones, but in the respect of caking when cold, etc., they are practically identical; they are also made in just the same manner.

Bread poultices are also in very common use, although they are rather difficult to make of the right consistence, neither sloppy nor crumbly, and so as to be non-adherent to the skin. Their lightness is their chief merit.

The readiest way, but one which will do only for small poultices, is to take a slice of stale bread without crust, to place it into a scalded basin, and pour boiling water upon it. The basin should then be kept hot upon the hob, or in an oven for a few minutes. Then the water should be poured off it as completely as possible, and the remaining bread pulp spread out upon linen or tow as in the case of linseed. But no large bread poultice of any consistence can be made in this way; if this be required, the crumb of a very stale loaf should be passed through a grater until it is like coarse flour. The poultice can then be made in the same way as a linseed one, and if spread out to a similar thickness will be a much lighter poultice. The lack of any natural oil in the bread must be made up by pouring a little olive oil over the surface of the poultice when made, or it will stick to the skin.

A Starch poultice is non-irritant and keeps its heat well. A stiff starch *paste* should be made with cold water in a basin, and then enough boiling water added to bring this to a proper consistence, the mass being then spread upon linen.

Starch and iodine chemically combine to form a mass which may be termed a cold poultice, and which is a very useful application for sluggish ulcerations. It is made by adding ½ oz. liq. iodi to a hot starch jelly, *which itself has* been made by adding 6 oz. of boiling *water to 2 oz.* of starch.

Bran poultices are made simply with bran and water; they are light but do not retain the heat well.

Yeast poultices are the last we shall mention. One form consists simply of a mass of warm dough which is at the time fermenting through the action of yeast added to it (either brewer's yeast or any other kind), the quantities required being roughly 14 oz. flour, 6 oz. brewer's yeast, 6 oz. hot water (*i.e.*, 100° F.).

Another form of yeast poultice is made by spreading warm yeast over an ordinary linseed or bread poultice. Both kinds have been supposed to exercise a special cleansing action upon sloughy wounds, gangrenous parts and the like.

A *Fomentation* is made by soaking a piece of flannel in boiling water, and wringing it as dry as possible in a warmed towel. Some few people, laundresses especially, are able to perform this wringing with their unaided wrists, but for most it will be necessary to use a set of wringing sticks. These consist of two pieces of stick, like rulers, about 2ft. 6in. in length, passed through the ends of a round towel about 2ft. 6in. by 10in. When the soaked flannel is picked out of the boiling water it should be allowed to drip for a few seconds, and then it must be placed in the centre of the towelling, and the whole twisted up by the leverage of the sticks, until no more water comes away. This should take but a few moments. Another good way is to sew the ends of the flannel together, and to pass the sticks through, before the boiling water is poured on to it. It can then be lifted and wrung without loss of time, and put into a dry warm towel.

For a simple fomentation the flannel should just be applied to the skin as an application of warmth and moisture, and covered with a piece of oiled silk slightly larger than the fomentation; over this again a layer of cotton wool should be laid, and the whole fixed with a triangular bandage or a few turns of a roller. *Instead of* ordinary flannel, boracic lint is frequently *used, and has the* advantage of being antiseptic. But *these fomentations* are often used with some counter

irritant or anodyne; thus laudanum or the tincture of belladonna may be sprinkled over the flannel, or turpentine is used more frequently still. This last forms the common turpentine stupe, so often used for lumbago. In all cases if the fomentation is to produce its proper action, the flannel must be wrung dry out of boiling water, and if the wringing be not effectually performed, it is quite likely that some scalding of the skin will take place.

CUPPING, ETC.

Cupping. By means of "Cups" the blood may either be merely drawn to the surface by taking off the atmospheric pressure, or it may, having been thither attracted, be removed by a scarificator. The former proceeding is "dry," the latter "wet" cupping. The nape of the neck and the posterior surfaces of the thorax and loins are by far the most common situations, but any part which will hold the glass will do.

FIG. 64.
A Cupping Glass.

In order to cup successfully some dexterity is required. The principle on which it depends is the creation of a considerable vacuum beneath bell-shaped glasses, which are made in various sizes (Fig. 64). These glasses are sometimes made so that they can be attached to an exhausting syringe, like the bell jar of an air pump. But in skilful hands a better vacuum is obtained by quickly rarefying the air by heat. A good cupper will do this by simply putting a lighted paper spill within the cup for an instant and immediately applying the latter to the surface of the skin; but for most people it will be easier to put a few drops of spirits of wine into the cup, and to distribute the spirit over its interior. A pledget of cotton wool placed on a stick should then be dipped in spirit, lighted, and

mopped round the inside of the glass. This will produce a large but momentary flame, and as soon as it is alight, the cup should be "clapped" upon the required place. The flame will be immediately extinguished, and the vacuum will show itself by an almost instantaneous rising of the skin.

The essential points to attend to are, that only just so much spirit should be put into the cup as will moisten its sides, and that the rim of the cup be applied perfectly to the skin, so as to exclude all air.

In *dry cupping* six or eight glasses are frequently used, and in the absence of those of the regular form, wine glasses will do nearly as well, although their sharp edges are apt to cause pain.

If *wet cupping* is to be practised, one, two, or more glasses are placed on the skin as before; as soon as the skin has risen within them they are removed, and numerous small incisions are made in the swollen area, by means of a scarificator. The cups are then replaced (the measure for their exhaustion being repeated), and will quickly be nearly filled with blood. They then become loose and must be taken away with their contents. These cups can again be applied, if still more blood be required, and when the operation is over, the wound should be lightly and simply dressed.

Leeching. If leeches are to be applied anywhere within the cavity of the body, such as in the mouth, nose, etc., a leech glass from which they cannot escape should be used; but if they are required for outside surfaces, they may be placed within a pill-box, covered with a piece of lint, or held lightly in the hand. The part to be leeched should be washed with warm water, or milk, and must be perfectly clean. Those leeches should be chosen which are the thinnest and most lively.

It is estimated that a leech should extract from ʒj to ʒij of blood before it is gorged, but if a poultice be put over the bites, much more will flow.

A leech should never be allowed to bite into a vein, or *troublesome* hæmorrhage may follow; pressure

would always stop this, in any situation where it could be applied, but it may be necessary to adopt such measures as passing a needle below the bite, and twisting silk round it, etc.

Blisters are usually produced by painting blistering fluid (Liquor Epispasticus P.B.) over the required area, or by applying a cantharides plaster, cut to the desired shape. If there are any hairs on the part to be blistered, they should be shaved off, and the skin washed with a strong soap, to remove the natural oil.

Any form of blister will rise less painfully, and more effectually under a light bread or linseed poultice. If the blistering fluid be used, the most convenient way to apply it is to cut a hole of the desired size in a piece of note paper, to hold it firmly over the part, and then to paint on the fluid with a camel's-hair brush. In this way the blister is strictly limited. Another plan is to smear a simple ointment round the part to be blistered.

The dresser or nurse must be careful to keep the hands well away from the eyes during the application of any blistering fluid.

When the bleb has fully formed, it may either be snipped at its most dependent part, and the serum soaked up with blotting paper; or if it be desired that the blister should remain open for some time, the whole cuticle should be cut off, and the sore dressed with some irritant ointment, of which the unguentum sabinæ is the most frequently employed. (Blisters are occasionally dressed with mercurial ointment, when a powerful counter irritation is required.)

CHAPTER VI.

Of the Dressing of Burns, Scalds, and Bedsores.

For the purposes of the dressing of these injuries it will be convenient to divide them into burns which are (1,) important by reason of their extent and position, and (2,) important by reason of the depths of tissue destroyed.

To the first class belong all extensive scalds or burns, especially those occurring on the chest, abdomen, or head; to the second, burns, or, more rarely, scalds, wherever they may occur, in which the whole depth of the skin has been destroyed, so that on healing, a contractile cicatrix is the result.

I. *Burns or Scalds important from their extent and position.*

No class of injury produces such grave depression of all the functions of life, such profound "shock," in comparison with the actual damage to the tissues, as does a large burn or scald. This depression occurs wherever the injury may be situated, and is in direct relation to its superficial extent; but it is especially marked if the chest or abdomen be burnt, and is more profound in children than in adults. It may, moreover, be aggravated by exposure, or diminished by protection from the air, to a very marked extent.

This primary shock is often very prolonged, and when it passes off is apt to be succeeded by a congestion of internal organs, as of the lungs, intestines, cerebral meninges, kidneys, etc.; or later still, the patient may have to go through an exhaustive process of suppuration.

The periods of greatest risk to life in these cases are, *first, during the* few hours immediately succeeding the *injury, when it* may be doubtful if the patient can *rally from the* primary shock, and after that, during

the period of internal congestion or inflammation, which rarely extends beyond the first fortnight.

The mode of treatment will depend to a considerable extent upon the depth and extent of the burn and also upon the resources at hand. As the patient is already collapsed, care should be taken that during the necessary manipulations of dressing he is not unnecessarily exposed. If the collapse is severe it may be found advisable in many cases to wait until by stimulants and warmth the circulation is somewhat restored, and the pain relieved by a dose of opium. If the burn is extensive, one portion at a time should be dressed, the rest of the body being kept covered up. The clothes must be removed with the utmost care, being cut away from the burnt surface when necessary, so as not to further damage the tissues beneath. A very good plan is to immerse the child in a boracic bath at a temperature of 100° F. This will ease the pain and relieve the collapse, whilst the burnt clothes are floated off and the surface of the wound is cleansed. If means are at hand for maintaining the water in the bath at a constant temperature, the child may in suitable cases be kept in it till sloughs have separated and the surface is quite clean; or the bath may with advantage be used in the subsequent dressings of the case.

In the treatment of burns all our endeavours should be directed towards rendering the surface as aseptic as possible. By this means the stage of suppuration may be much abridged and the loss of tissue and subsequent scarring and contraction will be diminished.

Attention must first be given to the condition of shock, which will generally be present. The patient must be kept warm, and should lie with the head low. Hot water bottles, etc., may be used, and brandy or sal volatile administered, preferably in small and frequent doses. If the collapse be profound, a mustard plaster may be placed over the heart, the feet put in very hot water, or ether injected hypodermically.

Some preparation of opium should be given to relieve the pain.

Various aseptic methods are in use, the choice of which will depend upon the extent of the burn and the resources at hand. After being soaked in the boracic bath the patient is taken out, dried, and the burnt parts dusted over with subnitrate of bismuth, or powdered boracic acid, and subsequently enveloped in cyanide or iodoform gauze and absorbent cotton wool.

In hospitals a more thorough method may be adopted in suitable cases. It is especially indicated in deep wounds with considerable destruction and charring of tissue. Mr. D'Arcy Power* gives the following details for its performance:—As the process is painful and lengthy, the child should be anæsthetised whilst it is being carried out. All shreds of tissue whose vitality has been destroyed should be cut away. The parts are then lightly and thoroughly washed with soap and water, and subsequently with ether. The burnt surface is then lightly powdered with subnitrate of bismuth, and covered with cyanide gauze and absorbent cotton wool. The dressing should be as light as possible, and not changed more often than is absolutely necessary.

Frequently means are not at hand for the above thorough methods of treatment; or the burn or scald may be quite superficial and limited to the cuticle, in which case they may be unnecessary. Blebs should then be snipped, and the surface spread with lint soaked in or spread with the following materials:—

(1.) *Carron oil*, a mixture of linseed oil and lime water in equal parts. A much better mixture is obtained by using, instead of linseed oil, olive oil, to which 10 per cent. of eucalyptus oil, or $\frac{1}{10}$ per cent. of *thymol* has been added.

(2.) Carbolic oil. This may be used of a strength *varying from* 1 part of carbolic acid in 10 parts of

*"*Surgical Diseases of Children.*" H. K. Lewis, 1895.

olive oil to 1 in 40. It has this great advantage that it produces marked anæsthetic effects.

(3,) *Boracic acid ointment*, generally employed diluted with vaseline and spread upon strips of lint.

(4,) Saturated solution of common washing *soda*. This frequently gives great relief to the pain.

(5,) *Flexible collodion*. This answers admirably for painting over the surface of small burns.

(6,) Saturated solution of *Picric acid* is said to be an excellent application, allaying pain and preventing blistering in the slighter forms, and acting as a good antiseptic in the more severe forms.

Whatever method is adopted, these points should be borne in mind. Strong antiseptics should not be used, they are irritating, and liable on account of the great absorptive powers of the burnt surface to poison the patient. Keeping this in mind, the burn should be rendered as aseptic as it is in our power to do. Dressings should be as infrequent as possible. If frequent dressing is inevitable, it may be advisable to perform the first two or three dressings under an anæsthetic, not only because the burnt surface is exquisitely tender, but on account of the shock caused.

If burns are foul, and there is a quantity of sloughing tissue to separate, the wound may be dressed frequently with hot boracic fomentations, or the patient may be immersed for a time in the hot boracic bath.

Skin grafting.

Portions of epidermis when applied to and retained upon the surface of healthy granulations, form foci from which the skinning over of the surface proceeds, in this way hastening the ultimate covering in of the sore and diminishing the contraction that is so apt to occur in the course of healing.

To obtain any success in skin grafting, the granulating surface must be typically healthy. Given a good soil, it is only necessary to plant a number of pieces of detached epidermis, the smaller the better, upon it, and to fix them there without disturbance for

not less than two days. The grafts should only include the horny and Malpighian layers of the epidermis, and may be snipped off with ordinary curved scissors, or with the special ones (Fig. 65), devised for that purpose.

FIG. 65.—*Skin Grafting Scissors.*

The grafts should not be handled, but should be immediately placed, the dermal side downwards, upon the granulating surface, which must itself be cleansed and dried beforehand. The grafts are usually protected by small pieces of gutta-percha tissue or oiled silk, and the dressings applied. The same method of dressing may be adopted here that is mentioned below as suitable for the large skin grafts.

Thiersch's method. A better method of grafting than the preceding is one introduced by Thiersch, the main feature of which is the large size of the grafts used. The granulating surface, which must be quite healthy, is sterilized by an antiseptic compress the day previously. To render the surface as unirritating as possible, the antiseptic is got rid of by washing with normal saline solution (1 per cent. salt solution) made with boiled water, and applying for a short time a compress soaked in the same fluid. The patient having been anæsthetised, the granulations are scraped away from the surface, and all bleeding stopped by pressure with aseptic gauze. The grafts, which should be as large as possible, from two to three inches long and one to two inches broad, are shaved from the arm or thigh by means of a razor, care being taken that the true skin is not encroached upon. These are

applied to the rawed surface when all bleeding has ceased. As much of the surface of the wound should be covered as is possible. It is then dressed with sterilized gauze, which should for the first week be moistened with aseptic saline solution. Success depends largely upon the avoidance of irritating antiseptic solutions, the only fluid used throughout being a sterile solution of common salt. The surface from which the grafts are taken, which should show but slight oozing of blood, is dressed aseptically and quickly heals over.

II. *Burns, important through the depths of tissue destroyed.*

Those burns which destroy muscle, tendon, and bone, are either immediately fatal, as in most cases when the trunk is involved, or, if in the limbs, produce practically the same condition as that of gangrene.

As to the general management of such cases, nothing further need be said than that they require the same treatment in the first instance as the milder kinds of burns, both for the shock and the local injury.

But burns frequently are inflicted, of which the appearance at first sight is not different at all from that of the large superficial injuries we have been considering, and which indeed may be quite as large, and attended with as important a degree of shock. Nevertheless, in all the later stages of repair, this class of burns, those namely where *the whole thickness of the true skin has been destroyed*, follow a very different course from the superficial ones, and one harder to treat.

Not that these burns are slower to heal than the other ones; indeed, if they are left alone, they will close over more quickly, by dragging the margins together towards the centre; but it is in this contraction of the edges, and in the fact that the process of shrinking does not cease even when the sore is closed over, that the especial difficulty of these cases consists, and the dresser will assuredly find himself on the horns of a dilemma, for either he must, by fixing

the parts to prevent contraction, greatly retard their healing; or, if he allow the edges of the burn to come together anyhow they will, he will quite certainly be accessory to the development of deformity, while for his consolation he has only the knowledge that, let him try his best, the contraction will almost certainly beat him in the end.

In so far as the actual dressing of the injury is concerned, applications similar to those mentioned for more superficial burns will be appropriate.

The contraction begins very insidiously, but becomes more and more marked and stubborn as the case goes on; as has been said, it does not cease with the covering over of the sore surface, but for months, or years, bands of contracting tissue will form in the ribbed and furrowed scar.

The effect of this contraction shows worst when the face, or neck, or the flexor aspect of any large joint is involved, and most surgical text books have representations, not at all exaggerated, of the deformity which may thus happen.

To combat this misfortune is very difficult, and the dresser may often wisely make up his mind to a certain amount of undeserved blame in any event. But much may and should be done by steadily and patiently splinting, or fixing the part in some way or other, and by willingly exchanging for a quick, a very slow healing. So, too, the effect of the patient, daily application of the solid nitrate of silver, should not be forgotten. Something may perhaps be done, too, by skin grafting. But probably more effectual improvement can be attained after the burn has healed by stretching the cicatrix, than during the healing. Though it has several times been pointed out, it is still often forgotten that this contracting scar tissue is as distensile as it is contractile, if it be properly manipulated, and that by patient handling a rigid *tendinous band may* be converted into a supple elastic *one. The results* of prolonged stretching, kneading, *and shampooing the* scars of burns are as satisfactory

as those of plastic operations for the same end are disappointing.

An anæsthetic is sometimes desirable upon the early occasions of kneading and stretching, and the progress of the extension should be slow and gradual. Care must also be taken not to tear through the superficial cicatrix and thus to cause a wound. A little oil may be used to rub into the scar during the manipulation. This way of treating a contracted cicatrix is too often neglected in favour of more tempting but far less satisfactory plastic operations, and even if the latter be deemed necessary, the preliminary kneading will have greatly improved the nutrition of the parts concerned.

Scalds or burns of the larynx and pharynx present such especial features that they must be mentioned separately.

They are produced generally by drinking scalding liquids, and are thus far more frequent in children than in more sensible adults. (The habit of teaching children to drink out of the spout of a kettle will account for more scalds of these parts than all other causes put together.) But breathing hot air, as in a fire, may produce the same effects, and practically the action of any chemical caustic is the same, in this situation, as that of the thermal ones.

Scalds of the pharynx itself are not usually very serious, unless the consequent swelling of the tongue and fauces reaches a very high degree; but when the scald extends further down, so as to effect the *rima glottidis*, and the œsophagus, there is both an immediate and remote risk of complications. The remote one is that the scald of the gullet may cause a contracting cicatrix, and thus become itself a simple stricture, or that the cicatrix may be the seat of a new growth, and thus develop into a malignant one.

But it is with the immediate risk of suffocation through œdema of the larynx that we have here to do. These cases are always full of anxiety, and must *be most* anxiously watched. If, shortly after the *accident*, there be a distinct difficulty of breathing

from obstruction, the surgeon will not wait for more urgent symptoms, but will at once perform laryngotomy, or in young children a high tracheotomy. The case should then be treated with a warm moistened atmosphere, and in all other respects as if it were a case of diphtheria or croup in which the operation had been called for. But often there is a deceitful calm for some hours, and we may be tempted to think that the larynx has escaped altogether, when suddenly the most urgent dyspnœa may be developed. Whenever, therefore, inspection of the mouth and throat shows that a scalding fluid, or a corrosive liquid has passed down it, the patient must be carefully watched, made to breathe a steamy atmosphere, and the surgeon should be ready himself, and ha e his instruments in readiness, to open the windpipe if necessary.

OF THE PREVENTION AND MANAGEMENT OF BEDSORES.

Experience alone as to what bedsores may become if neglected will enable the student to realise the extraordinary amount of destruction which this form of ulceration from pressure can cause, or the rapidity with which it spreads, or the insidiousness of its commencement. It is also very necessary for every surgeon and every nurse to understand that, with the exception of certain paralytic cases, bedsores are almost always preventable and, when present, are as a rule, standing evidence of neglect or mismanagement. But, though we will not qualify this assertion further, it must be allowed that sometimes it is extremely hard to prevent soreness, as, for example, in a case of hip disease with extreme emaciation, contraction of both legs, and suppuration. Sometimes, again, tissues have such a low vitality that it seems as if the least touch would produce a slough; still, with incessant watchfulness, with the exception of the paralytic cases we have mentioned, bedsores *can* be prevented, although once *begun they are very* hard indeed to arrest or to heal.

In warding off the formation of bedsores, attention *must be specially* directed to the following points:—

1. The bed must, in all cases, be smoothly made, elastic, and soft; a spring mattress is often a great help, and water cushions may be used for the buttocks, etc. But in cases where there is a well marked tendency to soreness there is nothing like a complete water bed. In filling one of these beds, care must be taken to have the water properly warmed, and not to put in more than will just support the patient.

2. In every possible way *continuous pressure must be avoided* upon the parts which are liable to become sore, such as the sacrum, trochanters, ischial tuberosities, heels, occiput, elbows, or the spines of the scapulæ. Taking every precaution when precaution is needed, as in fractures, against doing local harm by movement, in some way or other it must be managed that the patient shall shift his points of pressure upon the bed, lying now a little low, now a little high; first with the head to one side, next day turned slightly over (for the least shift is as efficient as a great one) to the other; a pillow may be put under the knees one day and omitted the next, etc.

3. Something may be done to improve the nutrition of the skin by bathing with stimulant lotions (whiskey, or brandy-and-water is a common application). Starch or violet powder should be freely used, and if the tendency to soreness appears imminent, the part, which will be a bony prominence, should be covered with a protective adhesive plaster spread upon chamois leather or felt.

Nowadays in hospitals or where skilled nursing has been employed from the first, such precautions as we have mentioned will be sufficient to prevent soreness altogether, or at the worst to limit it to a superficial excoriation. The cases we meet with where true ulceration is present, are those where there has been previous neglect of nursing care, through ignorance or poverty.

Such cases are not infrequent among those who come at last to be hospital in-patients, and whatever the nature of the original illness may be, the bedsores will *count heavily* against recovery. These ulcerations are

indeed very hard to dress; they present the characters of deep, foul sloughing ulcers, not generally painful, but tending to destroy all the soft parts between the skin and the bone, and often complicated by necrosis of the bone itself.

The great point then is to remove all pressure, and to get the ulcer to begin to clean. Hot boracic fomentations will be the best treatment at first, and afterwards when the sloughs clean off, stimulant resins, such as tinctura benzoinæ co., balsam of Peru, etc., will suit well.

Very much will depend upon whether there is improvement of the constitutional condition, or the reverse. If there be general recovery, local recovery is often extremely rapid when once it is started.

SECTION III.

THE TREATMENT, IN THE FIRST INSTANCE, OF ACCIDENTS AND EMERGENCIES.

CHAPTER VII.

Of the Immediate Treatment of Fractures, Improvised Splinting, etc.

The first time the student makes a post mortem examination on a recent case of fracture, however simple, even if there be to outward seeming only a very slight amount of injury, he cannot fail to be astonished at the extent to which the tissues have really suffered, at the amount of bruising and disorganisation of the muscles, and at the infiltration of all the softer parts with extravasated blood. And yet, provided that such a fracture be simple, or if compound, that septic forms of inflammation are successfully warded off, it is astonishing how quickly tissues, bruised and hurt as these are, will recover.

A further examination of a recent fracture on the post mortem table will show that the injury of the soft parts has been, to a large extent, due to the working of the sharp, splintered fragments among the more yielding tissues; indeed, in fractures by indirect violence, this is the only cause of their injury.

In considering, then, the general line of conduct in cases of fracture, the student should think of the condition of the limb inside the skin, and appreciate that it is probably much worse than appears upon the surface; and further, he should recollect that between the time of the occurrence of the fracture and its being set, *careless* or improper handling may do *much mischief*, so that it not infrequently happens that by

movements on the part of the patient or of his friends, a simple fracture is converted into a compound one; or, much more rarely, an important vessel or nerve is seriously injured.

It will therefore be seen that there are many points for consideration in the treatment of a case of fracture, in addition to the actual, and, so to speak, permanent setting of the bones.

So long as the patient can be left lying, little further harm can come to the broken bones, so that there need be no hurry.

The chief points in the immediate treatment of fractures, are:—

1. The prevention of further injury *(a)* by means of some improvised support or splint, *(b)* by proper precautions in transport.

2. The arrangement of the bed on which the patient has to lie, probably for some weeks, the getting him into it, and the general management of affairs in the interval which must elapse before the setting.

1.—Measures for Prevention of Further Injury.

Improvised Splinting.—This is desirable when there is any appreciable movement between the fragments, any painful spasm of the muscles, or whenever the patient has to be moved to any distance. The ways in which more or less efficient splints may be made are very numerous, so that in this matter the principles of the improvisation being indicated, the details must be left to the individual readiness and energy of the surgeon. Whatever comes first to hand will of course be used first, as firewood, match-boarding, cigar boxes, book covers, paper, etc., and it will hardly ever be found difficult to give sufficient support to any fracture. Even a newspaper will be of great service, if it be folded often enough, especially if it be bent round so as to form a portion of the hollow cylinder. In *fractures of the leg*, too, the use which may be made *of the opposite sound* one as a splint, by tying the two *limbs together*, should always be remembered.

This figure has been drawn to show a few of the ways in which common materials, such as firewood, towels and handkerchiefs, may be used for the temporary support of fracture of the collar bone, humerus, and of the bones of the leg.

FIG. 66.—*Illustration of Improvised Splinting.*

As a rule, *removal of clothes* is unwise until the patient is about to be put into bed, when it can be done deliberately, and so as to cause as little pain as possible; but if the fracture be badly compound, or if there be serious hæmorrhage, the clothing must be removed for the careful examination of the parts. These cases of hæmorrhage in connection with fracture are always serious, and the necessity of attending to this condition will take precedence of the question of supporting the broken bones.

Improvised splints should always be put on in a way which will allow of their ready removal, and in *applying them* there need be no effort made accurately *to replace the* fractured parts, but merely in a general

and gentle fashion to reduce the deformity, and give support.

The following directions will serve as examples of what may be done in some of the more common accidents involving fracture of bones, in the way of a rough and ready splinting, it being understood that they are *examples* only.

(1.) *Fractured Lower Jaw.* This will have occurred as a result of some direct violence, and there will be a good deal of bruising of the soft parts. All that will be required in the first instance will be to tie up the lower jaw against the upper one with a soft handkerchief, passed under the chin and over the vertex of the skull. The patient must not talk, and if any nourishment has to be taken it should be poured slowly into the mouth at one of the angles. If any long time must elapse between the accident and the permanent setting, a gutta-percha or plastic felt splint may be made and fixed on with the *four-tailed bandage* (Fig. 67).

The moulded splint should be fashioned out of an oblong piece of gutta-percha or felt, about 10in. by 5in. for an adult man (the size will of course vary), and must be cut down the middle of its length, except for about three inches in the centre, so that it is of the shape of the centre of the four-tailed bandage which has been before described. To mould and apply it, the four ends thus made must be folded up while it is warm, exactly as the bandage is. It will be wise to cut out a paper shape first to secure an exact fit. If it be necessary, as for the dressing of a wound on the chin, a trap door may be cut in the splint.

(2.) *Broken Collar-Bone.* Practically this generally happens by an indirect shock, as by falling on the shoulder, or on the out-stretched hand. The patient instinctively supports the elbow and fore-arm of the injured side with the other arm, and so pushes up the *shoulder, which* would otherwise droop. If the patient *can be conveniently* put to bed on a hard mattress, *flat on the back*, with a small pillow between the

shoulders, and a very small one (or none at all) under the head, the fragments of the clavicle will come absolutely into apposition. But often when this accident happens, the sufferer has to travel for some distance, and although, by merely slinging the arm, all risk of any great additional damage will be avoided, a better plan is to use a couple of towels, or triangular bandages, in the way now to be described. With these the arm can easily be fixed in a position which will give complete comfort, and indeed, in many cases will bring the fragments into sufficiently good position to enable union to take place without any noticeable deformity. This method is also suitable for the permanent setting.

FIG. 67.—*Moulded Splint for Lower Jaw.*

In this injury the point of the shoulder is carried downwards, forwards and inwards. Treatment therefore consists in pushing the shoulder well up, in forcing the shoulder joint away from the side of the chest by a pad in the axilla, and at the same time in keeping the shoulder well back. A way in which this may readily be done is shown in Fig. 66 (and also in Fig. 68). A soft, but firm pad, of about the size of one's fist, is made, as with a cricketing cap or a newspaper, and is placed in the axilla; by this means the shoulder is forced away from the side, and the tendency of the broken ends of the clavicle to overlap is counteracted. The forearm is crossed over the chest, with the hand pointing to the opposite shoulder, the point of the

elbow being brought forwards across the thorax, while at the same time care is taken that the shoulder is carried well backwards. A towel is then folded as a broad scarf, the elbow is settled into the middle of it, and then, by tying the ends over the opposite shoulder, the hand and forearm being covered by the scarf, the arm on the injured side can be pushed well up. The other towel is then brought round so as to fasten the arm, forearm and hand, firmly to the trunk, and the ends are knotted or pinned beneath the opposite armpit. A reference to the figure will explain better than words can do, these simple but efficient arrangements.

FIG. 68.—*Treatment of Fractured Clavicle with two towels, or Triangular Bandages.*

(3.) *Fractures in the neighbourhood of the Shoulder Joint.* For this, inasmuch as the displacement and mobility of the fragments are both very slight, a well-adjusted sling is all that is required at first, or during removal.

(4.) *Fracture of the Shaft of the Humerus.* Here the displacement may be considerable, and the ends of the broken bone, by moving on each other, may cause much pain and muscular spasm. The weight of the forearm must be utilised to prevent overlapping of the fragments, and a little gentle traction may be made at the elbow. Some short pieces of firewood, cardboard, etc., should then be tied round the limb, outside the sleeve, with handkerchiefs, etc., care being taken that

those on the inside are so short that the circulation is not impeded at the elbow. The hand and wrist should then be slung in a towel folded scarfwise.

(5.) *Fractures about the Elbow Joint.* The forearm should be slung, but it will be unwise to attempt any reduction of the fracture, which is usually complicated with dislocation, till arrangements have been made for its regular setting.

(6.) *Fracture of the Bones of the Forearm.* The limb should be supported by two splints, which need not be very rigid (brown paper folded several times will do very well), placed along the front and back of the hand and forearm, and reaching from the elbow to beyond the tips of the fingers. The hand should be placed midway between pronation and supination, with the thumb upwards; the splint on the flexor side must not embarrass the brachial artery when the arm is bent. The splints may be tied on with handkerchiefs, and the arm supported with a broad sling.

(7.) *Colles' Fracture at the Wrist.* In these cases there is little risk of undue mobility. A simple sling, therefore, is all that will generally be necessary, but sometimes, when there is painful spasm of the flexors of the fingers, relief is afforded by a soft splint along the front of the hand and forearm, lightly tied on. The fracture should always be set as soon as possible.

(8.) *Fractured Ribs.* When an accident has happened, which in the nature of things may have caused one or more ribs to give way, and the injured person complains of a stabbing pain or "catch" in the breath, on inspiration, with other signs of embarrassment of the breathing movements, it will not be necessary in the first instance to distinguish whether there has been a bruising merely or an actual fracture of the thoracic walls. In the majority of cases it will be found that immediate relief is afforded by placing the hands on either side of the chest and compressing the thoracic walls gently but firmly. Very often the patient will have found this out, and may even have tied his scarf tightly round his body. Until a more complete support

can be given to the thorax by strapping and bandaging, something in the way of a scarf or towel must be tied round the chest with the tightness which will give the greatest amount of relief.

A patient with broken ribs may thus be able to get home without much suffering, but he should be cautioned against any movements which would require any but the shallowest respiration, for though he may be comfortable enough so long as the diaphragm alone is concerned in the performance of breathing, his pain would be much aggravated by any effort which would bring the chest walls into play.

(9.) *Fractured Spine.* Whenever, or under whatever circumstances, the back appears to be broken, no question of splinting can arise, but the harm, or rather the disaster, which may be wrought by rough or careless handling, cannot be too thoroughly realised.

The symptoms of fractured spine being present, the injured person should be placed in the supine, or prone position, on the ground, with the trunk as straight as it can be gently put. In the absence of a stretcher—a gate, hurdle, shutter, or some other rigid platform should be procured, and placed close to the patient, who must be placed on it with the least possible alteration of position.

(10.) *Fractured Pelvis.* This may occur from a fall, but in most cases the cause will be the passage of some crushing weight, as the wheels of a wagon. Little requires to be done in the first instance; but relief may be given by tying a broad scarf or belt round the pelvis, and the patient must be quickly placed on a stretcher or its substitute. It sometimes happens that even after a most severe injury to the pelvis, the patient is able to walk after a fashion, but this must never be allowed.

(11.) *Fracture of the Neck of the Thigh-bone:*—(i.) *Fracture in old people.* This will only require that the *patient be moved* with gentleness on a stretcher; no *other precautions* are necessary. (ii.) Fracture *with violence, and injury to* the softer parts around. This

will usually be extra-capsular, and generally occurs in adults. In any case precautions must be taken to prevent further damage in removal; these, however, will be practically the same as are required in the following case.

(12.) *Fractures of the Shaft of the Femur.* In consequence of the length and strength of this bone, its fracture may be attended with great disorganisation of the surrounding parts, and the injury is very easily made more serious still by rough or unskilful handling. In these cases the principal difficulty is that of transport, and the reader has only to imagine what might be the consequences of ill-advised efforts to move a heavy man with his thigh broken in the middle and unsupported, to see at once that no attempt should be made to move an adult thus injured till the limb has been rendered fairly stiff by improvised splinting. The end desired is practically to make the patient's body rigid from the armpit to the ankle, so as to prevent all risk of a bending or buckling up of the broken ends of the bone, which would otherwise readily occur. The patient should be kept lying absolutely flat on the back, and search should be made for something long and strong enough to serve as a "girder" to run the whole length of the body (a rifle or a broomstick will do admirably). This must then be laid along the injured side, the top going beneath the axilla, and the limb should be very gently straightened. The thigh generally presents a marked curve, with the convexity pointing forwards and outwards, and the foot is rolled outwards. Then with numerous handkerchiefs, towels, etc., this long splint must be fastened on, passing the bandages round the thorax and pelvis. Along the inner side of the leg, a short splint, say an umbrella, should then be placed, and a back splint of thin board, or stiff paper folded, may be placed along the back of the thigh. These supports must then be fastened round the thigh, leg and foot, as can best be managed. *Finally, the injured limb must be tied to the sound one in two or three places.*

If these proceedings have been thoroughly carried out, it should be possible, although it would be unwise, to carry the patient simply by the head and heels, without any bending.

(13.) *Fracture near the Knee Joint.* If the limb be lying fairly straight, an inside and an outside splint, as two walking sticks, should be tied on with several handkerchiefs, avoiding the actual seat of fracture; or what will be found more comfortable, especially if the limb be bent, will be to place beneath the joint a thick pillow or other support, keeping this in the flexed position with a few bandages tied round all.

(14.) *In a Fractured Patella*, the great indication is to avoid increased separation of the fragments and further damage to the knee joint beneath. This will best be done by a strong back splint of umbrellas, boarding, etc., running behind the whole length of the thigh and leg, and tied on firmly with handkerchiefs.

(15.) *Fractures of one or both Bones of the Leg* may be the result of either direct or indirect violence, and because the skin is so thin over the shin bone they are very apt to become secondarily compound, and may be so from the beginning. These fractures are thus often extremely severe injuries, and require much care and gentleness in handling. If the limb be very much crushed, with comminution of the bones, whether the fracture be compound or not, probably the best plan will be to take a soft pillow and arrange the stuffing so as to form a trough, lay the limb in it, and tie it up with soft bandages. In slighter cases, splints long enough to reach below the feet must be put on both the outer and inner sides, or on the outer one only. (See Fig. 66.) If the boot can be easily taken off, as by cutting up the side springs or laces, this should be done, but it should be left alone if it seems that removal could cause the *slightest damage.*

(16.) In Pott's Fracture with Dislocation at the Ankle Joint, it will be unwise to use any force to rectify the

deformity, which will often be considerable. The boot should be cut off, and a splint, extending from the knee to below the foot, should be put on the inner or the outer side, as seems best, with handkerchiefs. The foot should be placed in as nearly a natural position as it will readily come to.

Finally, in those cases of *Compound Dislocation of the Ankle*, or of a *general crush* of the parts about the foot, caused by great violence, little can be done, except to tie the parts up in a pillow, or to use such other materials for soft support as the circumstances of the case will admit of.

Methods of Transport of cases of fracture, and precautions to be taken therein :—

In military surgery it naturally happens that great stress is laid upon the best ways of moving people, helpless from injury, whether through fracture or otherwise. A regular stretcher drill is laid down, and other plans for lifting and carrying are carefully considered.

But in civil practice, and in connection with the proper work of house surgeons and dressers, elaborate descriptions of the different kinds of stretchers and of kindred details would be out of place; still, it is desirable that all civilian dressers, surgeons, nurses, or porters, who have to do with helpless people, should have some acquaintance with the best ways of lifting and moving them, and one or two of these ways will here be mentioned, supposing always that the injured person is unable to walk at all. (The case of children need not here occupy our time.)

If two people only, A and B, are available for the transport, and the person is able to sit up a little, the best way to manage will be for them to make a "sedan chair" by crossing their arms. Of this "chair" there are three patterns.

(1.) The fingers of the right hand of A and the left hand of B are interlocked to form a seat, while A's *left hand is* placed on B's shoulder and vice versa, to *make a back* support ; or,

(2.) Both A's and one of B's hands are joined to form a triangular seat, and B's other hand rests on A's shoulder, forming a chair back.

(3.) But the third way (Fig. 69) is the best, where both pairs of hands are used, locked together to form a seat, and where the patient supports himself by his hands placed upon the bearers' shoulders.

FIG. 69.—*Hands forming a Sedan Chair.*

If the patient be quite helpless or senseless, whether he has to be carried any distance, or has only to be lifted on to a stretcher or bed, the assistance of three people is desirable, two, A and B, to do the lifting, and the third, C, to look after the injured limb and the patient generally.

A and B take up a position on the opposite sides of the patient, near his haunch bones, facing each other; they then stoop down, and each gradually gets one hand under his back, near the shoulder blades, till they meet and are clasped, the other hands are then passed and locked under the breech.

Having secured a firm grasp they rise together from the stooping posture with the patient, and are ready *to move. It is* not advisable for either to kneel, *unless they cannot* stoop low enough, but if one does *both must.*

A patient lifted in this way can readily be placed on a bed, or be lowered on to a stretcher for more convenient carriage. In lifting a stretcher the taller of the bearers should go to the head, and should give the directions as to the time of lifting, etc. The head should always be lifted a little before, and lowered a little after, the feet. In carrying anyone on a stretcher, the bearers should not keep step, but the left foot of the one must be put forward with the right of the other, to avoid swaying.

With regard to conveyance in cabs, a four-wheeler is much better than a hansom. If the injury be very severe the patient should be lying down if possible, either from seat to seat, or if that space be insufficient, a stretcher may be laid across the floor of the cab, both doors being opened.

When a patient has been brought to the bedside, it will generally be found convenient to remove the boots and outer clothing as he lies on the stretcher, and then to lift him on to the bed as described above, when the removal of the clothes may be completed at leisure.

II.—Of Fracture Beds.

There are certain points to be looked to with regard to the bed on which a patient with a fractured limb will have to lie, and inasmuch as it is probable that once there, any further movement will be hurtful, they should be considered and met *before* the patient is placed on it.

The essential qualities which the bed should possess are, that there should nowhere be any "sagging" or possibility of giving way, that the surface should be evenly smooth and comfortably elastic, and that the foot of the mattress should be somewhat higher than the head.

In practice it will be found that very few bedsteads fulfil these requirements; even the best (the wire-woven beds, or those with interlaced iron bands) will *allow of a certain giving way where the greatest weight of the body comes*, while this occurs to a much greater

extent in sacking, or sofa, spring beds. The evils of this yielding and formation of a hollow under the patient are not so apparent at first as they afterwards become; the patient gradually slips down, the head and shoulders are pushed forward, and the heels come up, until, instead of lying in a straight line, the body forms two sides of a triangle, the apex of which is at the ischial tuberosities, to the grievous alteration of the parts about the seat of fracture, and to the great risk of the formation of bed sores.

Fortunately the remedy is easy, and involves no apparatus, all that is required being a light wooden frame, or a few light boards, placed on the bedstead, underneath the mattress. If the mattresses are of the kind to be described directly, no discomfort will be felt after a very little time from the rigidity of these boards, even by those who are accustomed to lie softly, while they are quite as efficient as any special bedsteads that have ever been devised.

A big bed is a big misfortune in all cases of sickness, but especially in fractures. The best size is that of the ordinary single bed, as found in hospitals and elsewhere, namely, 6ft. 6in. by 3ft. 6in.

It is a matter of great importance that the *mattresses* in fracture cases should possess the qualities of smoothness and elasticity in perfection, and for this reason any form of "bed," either of feathers or any other material, is quite inadmissible. Flock mattresses are objectionable, as, even if they are well made, they tend in time to form knots or lumps. The best combination of all is a straw paillasse, and over that, one or two horse-hair mattresses, 3½ in. to 4 in. thick. Over the mattress one blanket is generally found useful. The sheets, etc., require no particular directions, save that if a draw-sheet and mackintosh are required, they should be arranged before the patient is put to bed.

In cases of fracture of the lower extremities, or of *the spine, all* pillows, bolsters, etc., are harmful, *except the merest* cushion beneath the head, at any *in the early* stages of union; and if the patient

can be induced to lie thus flat, the position will not produce discomfort after the first day or two. Any pillows should be small and firm, and covered with separate slips.

The bed being ready, the patient, if completely disabled, should be very gently lifted on to it; the clothing should be removed, cutting off the boots and ripping up the seams of the clothes, if this has not been done before, the sound arm or leg being the one which should first be slipped out of the sleeve or trouser. As a rule, everything in the shape of temporary splints may now be taken off and the limb should be placed in the most natural position in which it will easily lie, on a pillow fashioned into a kind of trough. Sand-bags are very often useful in restraining spasmodic movements or in steadying the limb. All pressure of the bedclothes must be taken off by a regular cradle, or one improvised out of some such thing as a band-box split open. Lint dipped in some evaporating lotion may then be applied to the surface of the fractured limb. If the case be a severe one, especially if there be much spasm, a hypodermic injection of morphia will now be found extremely useful.

Sprains.—This is a form of inflammation which may be either acute or chronic. It arises from a sudden twist or wrench, by which the capsule and ligaments of a joint, or the fascial structures in its neighbourhood, have been stretched or torn.

Sprains vary infinitely in their severity, both in pain, and in the extent and duration of the disablement, but it may be taken that they are severe or slight, in direct relation to the extent of mechanical damage done to the fibrous tissues about the sprained articulation. We shall here chiefly consider *severe* sprains.

These always occur unexpectedly, and call for prompt treatment, for the time the joint will take to *recover will depend* greatly on the measures which are *taken immediately* after the injury.

If a sprained joint be seen soon after the twist, there will have been no time for the development of inflammation. It is then, in many cases, possible to prevent this action coming on at all, by firm, even compression, and absolute fixation of the joint. The principles of the treatment understood, the details may be varied. Thus, for a badly sprained knee, the best course would be to put the patient to bed, to apply a Martin's bandage, or a wet roller, firmly, and then to fix the limb on a Nevill's or McIntyre's back splint, and to swing it from a cradle with an ice bag resting on the joint; so also, an ankle might be treated in somewhat the same way with a wet bandage and a Cline's splint, but it would be even better to get a firm elastic compression by layers of cotton wool, and careful bandaging, and then to put up the joint straightway in plaster of Paris. The limb should be kept for a fortnight or three weeks in this stiff case, and will then require passive movement, shampooing, etc., as described below.

The value of this "abortive" treatment of severe sprains cannot be overrated, but for it to succeed, the injury must be taken in hand at once. When pain, heat, redness, and swelling, the cardinal signs of inflammation, have once come on, a somewhat different line must be taken. Though it may be sometimes better to lay the joint simply on a pillow, it is still generally advisable that it should be supported, and if pressure can be borne, a wet roller or a Martin's bandage is often very serviceable. An ice bag, too, is a most salutary remedy, but it must be remembered that the joint is now inflamed and will bear only very gentle handling. Cold affusions, as from an irrigation apparatus, or a tap, or evaporating lotions may be applied. Sometimes, on the other hand, water as hot as can be borne,* or hot fomentations, or bran poultices are better, while if the inflammation be very severe, *leeches (say half-a-dozen* for a knee) are very useful.

* *This is a remedy* generally used by professional acrobats.

The duration of the acute stage of a sprain varies, and the condition only gradually passes off, leaving the joint weak and puffy, and susceptible to slight injuries, or apt to become painful with changes of the weather, etc. This condition of *chronic sprain* requires the most varied treatment in different cases, or in the same case at different times. At first it is often necessary to insist upon a splint, but this, if kept on too long, will lead to adhesions and stiffness. So too, the support of a bandage or strapping may be required for the atonic capillaries and veins, but the pressure causes wasting of the muscles if persevered with unduly.

In the later stages of the case all the surgeon's efforts should be directed to the getting the joint back again into working order. Cold and hot douches, shampooing and passive motion may be required, and, if there be much thickening, the joint may be strapped with an iodine or mercurial plaster. But in cases of severe sprain the recovery is often very slow.

In spite of all precautions, it will happen every now and again that joints which have been badly sprained (and the same holds good for dislocations), become fixed by internal or external adhesions, or by both, while the difficulty of movement is increased by muscular contraction. These cases give great employment to "bone-setters," who are often very skilful in freeing the hampered movements. If a joint be free from heat and tenderness on pressure, no hesitation need be felt in forcibly breaking down the adhesions, either by taking the muscles of the limb by surprise, or, what is generally better, by free flexion and extension under an anæsthetic.

The presence of *subjective* signs of pain need also be no bar to this forcible passive motion, provided the *objective* signs of inflammation are absent, for most fixed joints become neuralgic. Even in chronic inflammation it is not always wise to keep the joint fixed, but the discrimination of the cases which should from

those which *should not* be so treated, often involves very nice points of surgery.

In addition to the employment of douches and shampooing for the reduction of the thickening and puffiness which follow on a sprain, the effect of the constant (galvanic) current is so striking that it should be especially mentioned. The tendons get loose in their synovial sheaths, inflammatory exudations disappear, and even callous bone itself appears to be rapidly absorbed under this treatment. The current may be conveniently supplied by, say 10 to 20 Leclanché's cells, the negative electrode being formed of a plate of zinc covered with flannel, which can be so bent as to wrap round the joint.

Slight sprains do not generally require splinting, but they may often be cut short by very hot water, or by the firm pressure of a wet roller bandage, which will be found the best treatment for the casualty room, or by *massage* well applied. A Martin's bandage is also frequently used. When heat and swelling have come on, if a firm wet bandage can be borne, it is still the best treatment in most cases; if not, evaporating lotions, irrigation, or hot fomentations may be applied.

Lastly, in certain cases there can be no question but that forcible movement, with kneading of a sprained joint in its *acute* stage, and perseverance in its use, will sometimes cut the sprain short, that, in fact, it is true that a sprain can be *walked off*. The difficulty is to recognise the cases in which this method may safely be advised, so that the surgeon may be able to promise prompt recovery as the reward for present suffering, for the necessary manipulations are always painful. Experience alone will enable the surgeon to do this, and any rules would be misleading. One warning, however, may not be out of place, namely, that in the early treatment of twists of the knee joint, it is *hardly possible* to be too cautious, and in all cases *where there is effusion*, rest, and a back splint should *be insisted on*.

Bruises.—Whenever capillaries or veins are ruptured in or beneath the skin, some variety of *bruise* is produced. Under this head fall two chief kinds of injuries. In the first there is a general infiltration of the tissues, in the second there is a bag of blood, and, speaking generally, in the one the capillaries, and in the other a vein of some size, has been ruptured. In either case the great point to keep in mind is, that the effused blood should be *left alone*, except under one or two quite exceptional conditions.

For the common bruise, or infiltration of blood, in the vast majority of cases, no special treatment is required. It is very doubtful if any external application can appreciably affect the re-absorption of the effusion, or the course of the discolouration, but it is probable that local cold and astringent dressings may be useful, if applied early, in limiting the extent of the primary escape of blood. An evaporating lotion, composed of two drams of methylated spirit to the ounce of water, will be found very useful.

The astringent action of strong Liq. Plumbi Subacet. is also very effective, and the actions of cold and astringents may be combined.

A still better line of treatment is that by firm, even compression, but only when it can be applied in time to prevent the infiltration of the tissues taking place. A wet bandage, smoothly applied, or a Martin's india-rubber roller may in such cases absolutely prevent the development of an ecchymosis.

This moderate pressure can never be hurtful, but it must be remembered that the vitality is greatly lowered in bruised tissues, so that all tight constriction, or unyielding compression, as that of a circular piece of strapping, or the corner of a splint, must be avoided* lest an ulcer should be caused, which would certainly be slow to heal.

* We often see the effect of pressure in limiting ecchymosis, in cases of sprained ankle, when, in taking off the boot, the discolouration is found to be sharply limited at the level where the ankle is encircled.

Severe bruises will often be associated with great swelling and tension of the parts. This must be met by position and bandaging; only in the most extreme cases, when the vitality of the surrounding area of skin is seriously threatened, should the surgeon be tempted to relieve this tension by operative measures. The conditions are just the reverse of those present in inflammation, and an extraordinary degree of stretching will be now borne by the tissues without their giving way or sloughing. If it becomes absolutely necessary to incise an ecchymosed area, small and numerous punctures should be made, and antiseptic precautions must be strictly adopted. But it is, we repeat, generally bad surgery thus to interfere with the natural process of re-absorption.

CHAPTER VIII.

Of the Immediate Arrest of Hæmorrhage.

There are few accidents which test the qualities of courage, readiness, and energy, more than the occurrence of a violent hæmorrhage; and in such a case the prompt adoption of common-sense measures will be found to be of far greater service than any routine of book-learnt rules.

A few general principles bearing on this subject may be shortly considered, under the heading of "The Primary arrest of urgent Hæmorrhage."

The first measures to be taken are,

(1) Encouragement of the process of natural arrest, by exposure to the air, attention to position, and getting free circulation towards the heart in the veins.

(2) Prompt digital pressure, on the wound first, and afterwards upon the trunk vessel, if necessary.

(3) Absolute quiet, and the recumbent position.

Natural arrest, *Position* and *Pressure*, are the cardinal points in the primary arrest of hæmorrhage.

Arrest in capillary hæmorrhage is usually simple and quick enough. The capillary vessels proper, contract, and the blood coagulates over the surface of the wound, while underneath the surface of this coat of clot there is poured out a layer of highly coagulable lymph, which seals up the ends of the vessels, and is the first step towards the repair of the injury.

In the veins the chief agent in natural arrest is the contraction of the venous walls, combined with coagulation of the blood. This contraction occurs at the cut ends only, and does so more rapidly than in the case of arteries, so that one may often see the veins on the face of an amputation stump distended with blood, but with their ends completely closed, so that they take the shape of nipple-like projections.

Veins do not appear to retract so perfectly within their sheaths as arteries do; with regard to the later stages of the process of natural arrest, such as the formation of external and internal coagula, etc., all that need be said here is, that in its general outlines, the process is similar to what happens in the case of arteries, but that it is somewhat less perfect.

In the natural arrest of *arterial hæmorrhage*, it is convenient to recognise two stages, which may be termed those of primary and permanent arrest.

The process of primary arrest in the case of small arteries consists (*a*) in the retraction of the divided artery within its sheath, due to its longitudinal elasticity, and a narrowing of its orifice by the contraction of the muscular fibres of its middle coat; (*b*) in the formation of a coagulum of blood in the sheath of the artery, but outside the vessel, and in the tissues outside the sheath; (*c*) in the formation of a coagulum within the vessel.

The process of permanent arrest is a gradual one, commencing within a few hours of the primary arrest, and lasting for perhaps six weeks before it is complete. It consists (*a*) in the exudation of plastic lymph plugging the mouth of the artery, and surrounding it externally; (*b*) in the contraction of the artery and its contained blood clot; (*c*) in the infiltration of the clot within the artery by plastic exudation and the gradual absorption of the blood clot; (*d*) in the gradual conversion of this plastic exudation, both within and without the vessel, into firm fibrous tissue. Finally, all that is left of the divided vessel up to the nearest offshoot, is a fibrous cord which may itself in the course of years disappear.

If the vessel divided is a large one, or if from any cause the bleeding has been copious, there is added another factor in the arrest, namely, *syncope*, which, within certain limits, is often a most fortunate occurrence, for the enfeebled action of the heart gives time for clots to form in the vessels, and for contraction and retraction to go on.

Of *Pressure*, again, it has been well said, "There is no bleeding from the exterior of the body which cannot be temporarily arrested by firm pressure with the fingers."* It matters not for the moment whether the bleeding be arterial, or venous, or capillary; the thing required is to stop it, and pressure will always do this. Too much stress should not be laid upon the kind of vessels involved in the bleeding. A distended vein may bleed as furiously as an artery; so may a mass of capillaries in inflamed tissues. But in all, the first means of arrest must be local digital pressure.

Capillary Bleeding. — Brisk bleeding from small arteries, veins, or capillaries, is often best checked by simply keeping the wound cold. Exposure to the air, or to a stream of cold water, will aid the process of natural arrest, while swathing up the injured part may, by the increased heat produced, directly increase the escape of blood. If water is used, great care must be taken that it is absolutely clean. A very efficient method of stopping troublesome capillary oozing is by the use of water as hot as can be borne (about 110° F.). Pressure is sometimes useful, and in the case of limited incisions and abrasions, if contact with the air does not lead to a cessation of bleeding, it is best to make use of a little firm even pressure on the part, which will readily succeed.

Venous Bleeding.—In some books, especially in those which are written to gratify the taste of the outside public for amateur or domestic surgery, we may still read that venous bleeding occurs only from the distal end of the cut vessel, and therefore the proper thing to do in the case of a cut vein, is to put a pad somewhere below the wound. Such directions are wholly misleading. For ordinary venous bleeding, the first thing necessary is to see that there is nothing hindering the return of blood to the heart; the second, to remember that almost all venous bleeding will cease on raising the limb; and the third, to remember that

* *Erichsen's Surgery*, 8th Edition, Vol. I., p. 401.

pressure will always effectually stop the flow of blood, if it be applied to the wound itself.

Arterial bleeding. — The mode of treatment of arterial hæmorrhage will depend upon the nature of the wound, whether incised or punctured, and the means at disposal.

A. *Bleeding from an incised wound.*—If instruments are at hand, a search may be made for the bleeding vessel, which should be seized in a pair of forceps, and twisted or tied; or the forceps may be left on for the time being. If, however, as frequently happens in the case of accidents, there are no instruments handy with which the injured vessel can be seized, pressure should be immediately made on the main artery above (see compression of arteries), either by means of the fingers, or an improvised tourniquet, and kept up till surgical aid arrives, and the wound can be thoroughly examined under more favourable circumstances.

In certain cases, as in bleeding from scalp wounds, the hæmorrhage may be effectually stopped by pressure made immediately over the wound, a pad being maintained in position by a firm, knotted bandage.

Cases remain in which it is difficult or impossible to control digitally, or by tourniquet, the supply of blood to the part, as in wounds of the large vessels about the base of the neck, or a ruptured aneurysm. The bleeding should then be controlled by firm and judicious plugging of the wound, followed by firm pressure over it.

The best material for plugging a wound is gauze, either sterilized or medicated. Of the medicated gauzes, that impregnated with iodoform is the most useful for the purpose. Cotton wool should not be used for this purpose. It has the very great disadvantage that portions of it adhere to the wound, and difficulty is experienced in removing it subsequently. *If gauze is not at hand*, narrow strips of old and soft *linen, that have been* recently washed and ironed, may *be used.* Whenever possible, care should be taken

that the wound is plugged with the strictest aseptic precautions. This is, of course, not always possible in emergencies. In cases in which asepsis has been maintained, the wound may, under certain circumstances, be treated within forty-eight hours as a fresh wound, being drawn together and sewn up. The length of time that a tampon should be left in a wound, and the subsequent treatment, must be decided in every individual case, and is beyond the scope of this book.

Whatever material is used for plugging, should be systematically packed into the wound, care being taken that the deeper parts are plugged as well as the more superficial ones.

The wound when plugged, usually requires a firm compress over all. This may be conveniently made of several layers of lint, cut to the required shape, and secured by a roller bandage, or by a triangular or scarf bandage arranged so that the knot comes over the pad.

Pieces of sponge make a good plug, used dry, or with iodoform dusted on them after they have been thoroughly washed in an antiseptic solution. Their use is almost restricted now to the natural cavities of the body, such as the nose and rectum. When used in these situations a string should be attached to the sponge, to facilitate its removal. It is not a good material for plugging a recent wound, and should not be used for this purpose.

B. *Bleeding from a punctured wound.*—In these cases immediate treatment should consist in the careful and even application of pressure. If the wound is seated in one of the limbs, the main artery should be controlled by the fingers, or by means of a tourniquet (see Special modes of control of vessels), and by means of a pad over the wound, pressure should at the same time be made at the seat of injury. This will be sufficient to restrain the hæmorrhage, till more systematic methods of applying pressure can be made use of. For the successful application of *pressure*, Mr. Harrison Cripps ("Dictionary of Sur-

gery," vol. i., p. 96) lays stress on the following points:—(*a*,) The blood may be furnished at either end of the divided artery; (*b*,) Pressure is not only required over the wound, but along the course of the artery, both above and below it; (*c*,) The pressure must be disseminated along the course of the vessel, less pressure being in this way required to arrest the bleeding; (*d*,) The whole quantity of blood circulating in the limb should be lessened by bandaging the entire limb from below upwards.

Mr. Cripps gives the following directions: Bleeding being temporarily arrested by finger or tourniquet, the wound should be cleansed. A conical pad is made of from sixty to eighty pieces of lint, the smallest the size of a sixpenny piece, the largest an inch and a half in diameter. This is applied directly over the wound, and kept in position by two pieces of strapping. The limb is then evenly bandaged from below upwards, leaving out the wound. Two compresses made by winding strips of lint round the half of a pencil are then laid along the course of the main vessel, both above and below the wound. These are kept in position by separate bandages. It is a good plan to have a splint opposite the pads to prevent circular constriction of the limb. The firm pressure first applied should be maintained for eight to twelve hours. If pain or discomfort is complained of, a judicious snip of the bandage here and there, wherever it appears to be too tight, will give relief. In this way a diminishing amount of pressure can be maintained for several days.

Of Some Special Means for the Arrest of Arterial Hæmorrhage.

(1.) *By Digital Compression.*

The procedure which of all others is the simplest, in most cases the most efficient, and the readiest in cases of severe arterial bleeding, is the compression of the trunk vessel with the finger, above the seat of the injury, against some neighbouring bone. It is of course only

FIG. 71.– *Diagram shewing the position of the Principal Arteries.*– (See page 138.)

In compressing we should get the artery fairly against the bone, and press directly upon it. In this way a very moderate amount of pressure will suffice, and the pressure should be always as little as possible.

The position of the hand and finger to be employed will vary, but as a rule the thumb had better be used to make the pressure (Fig. 70), and reinforced if necessary by that of the other hand. The limb must always be raised.

The Position and Compression of particular arteries.

The following directions for the digital compression of particular arteries will serve also for their compression by the various forms of tourniquets, improvised, or of the regulation patterns. The accompanying diagram gives the position of the vessels in the situation where they may be compressed against adjacent bones. (See Fig. 71.)

The arteries of the Head and Neck.

In cases of injury to the scalp, the underlying skull affords an admirable resisting surface for compression, but the compression of a main trunk (such as the temporal or occipital on the head), at a distance from the wound, is not often effectual, in consequence of the extremely free anastomosis existing all over the surface. Nevertheless, in some cases, compression of the trunk of one of these vessels may be useful. In such a case they are readily found, and simple pressure against the bone with the fingers will suffice.

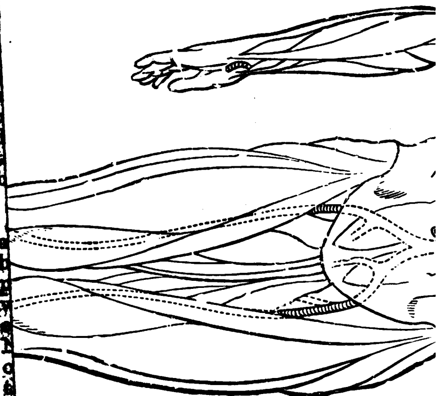
The *Occipital artery* on the scalp at first lies behind the mastoid process, and higher up may be felt pulsating, and may be compressed half an inch behind, and on a level with its base.

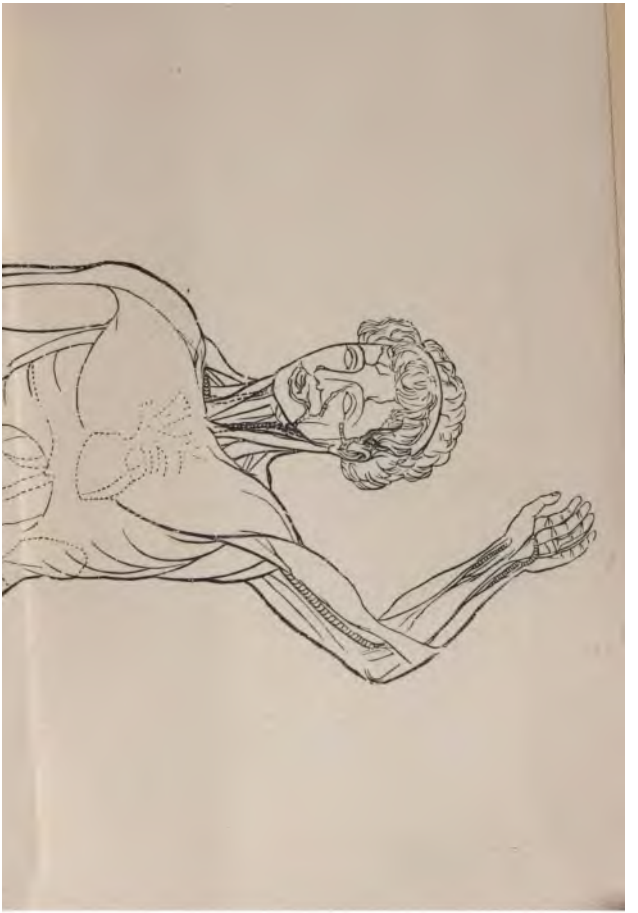
The *Temporal artery* splits up into its main divisions soon after it passes over the zygoma, and should, therefore, be compressed against that process of bone, immediately in front of the tragus of the external ear.

Some of its branches may also be felt, and may be *compressed higher* up on the frontal bone.

The arteries of the face, like those of the head, *anastomose so freely that* the compression of their trunks

FIG. 71.-- *Diagram shewing the position of the Principal Arteries.*– (See page 138.)





ompletely the circulation in their

frequently necessary to compress trunk, or its coronary branches, as mouth.

e *Facial artery* may be easily found, of the angle of the jaw, and may be

rteries form an exception to the rule compression against bone, for they sed between the fingers introduced nd the thumb on the face. They run close beneath the mucous membrane, rd of an inch from the border of the ression is often required in cases of ts about the lips, and may then be the blades of a pair of "bull-dog" or by the use of special "harelip" here are one or two patterns (Fig. 73).

he neck which pressed *otid*, and equires in con-

FIG. 72.—"*Bull-dog*" *forceps.*

roximity of structures which may not fely pressed on, such as the vagus jugular vein, trachea, etc.

thumb should be placed over the at the level of the transverse process

FIG. 73.—*Harelip Forceps.*

6th cervical vertebra, which is about the sterno-clavicular articulation; hen be made *inwards* and *backwards*.

and nerve, and is compressed against the transverse process or the "carotid tubercle."

The *third portion of the Subclavian* is the only one which it is possible satisfactorily to compress, and it is here sometimes very difficult, sometimes very easy to occlude.

The bone against which it is to be pressed is the upper surface of the first rib, immediately outside the tubercle for the insertion of the scalenus anticus. In children or thin people, pressure behind the clavicle downwards and *backwards*, at the inner margin of the subclavian triangle will control the circulation, no matter what the position of the limb and neck may be, but in even moderately fat people it will be necessary to depress the clavicle and shoulder, to bring the artery near enough to the surface. This is usually easy enough to do, but it occasionally happens in the course of operations about the axilla or shoulder, that the limb is required by the surgeon to be raised, while the assistant in charge of the vessel would prefer that it should be kept depressed. Especially does this happen in amputation at the shoulder joint, where, just at the moment when efficient pressure is most required (*i.e.*, just after the limb has been removed) the clavicle, freed from the downward drag of the arm, rises in the neck in a very exasperating fashion.

Various devices, such as the handle of a door key (Fig. 74), properly padded, a surgical "key" of a somewhat similar form, etc., have been devised to meet the difficulty, and it is sometimes advisable to divide the skin, platysma, and fascia over the triangle, so that the finger may be placed effectually on the artery. This may be readily done by dragging the skin downwards, and dividing it on the clavicle, as in the first stage of the operation for ligature of the subclavian.

This incision is sometimes, no doubt, absolutely necessary, but with regard to the use of the key, etc., *nothing is so effective* a compressor as the thumb, if *it be put in the* right place. The general mistake *is either making* the pressure far too much outwards,

near the acromion, or else not sufficiently backwards as well as downwards.

The first portion of the *Axillary artery* can hardly be reached for compression. The lower half of the second, and the third parts, however, are tolerably superficial, and can be compressed in the armpit, if that region be exposed by raising the arm. The pressure is made against the humerus in the same manner as in the following instance, and the vessel can be localized quite easily as it crosses to the outer side of the axillary space, and then lies amidst the trunks of the brachial plexus, with the coraco-brachialis to its outer side.

FIG. 74.—*Handle of Door Key, padded.*

Brachial artery.—This artery probably more frequently requires compression than all the others put together, by reason of the great number of accidents to which the upper limb is liable.

It may practically be said to be sub-cutaneous in its whole length (Fig. 71), and may be compressed very readily against the humerus. The inner edge of the biceps, which overlaps it in the middle third, is the guiding line for the vessel.

At the bend of the elbow the artery may be compressed by the fingers, but not easily, and therefore arrest of hæmorrhage by flexion is preferable.

In the forearm also, except at the wrist, the circulation in the *radial* and *ulnar* arteries can hardly be controlled by any means, short of strangulation. At *the wrist*, however, both arteries become superficial,

the radial somewhat more than the ulnar. The former lies between the tendons of the flexor carpi radialis and the supinator longus, the latter between the radial border of the flexor carpi ulnaris and the flexor sublimis, and here they may be readily compressed. The digital compression of the palmar arches is practically inconvenient and the pressure is usually made in other ways. (See bleeding from wounds of palm.)

FIG. 75.—*Digital Compression of Brachial Artery.*

The digital compression of the *Abdominal aorta* is in some cases not so extremely difficult as is often supposed. It can generally be effected in children unless they are very fat, and in adults if they are thin, have lax abdominal walls, and a bold anterior lumbar vertebral curve.

The spot where this compression should be made is shown in the diagram as a point three quarters of an inch above a line drawn across the abdomen from one iliac spine to the other (the level of the aortic division into the two iliacs), and a little to the left of the middle line. But before pressure is made, the exact position of the artery should be ascertained, for it frequently is in the middle, or may even deviate somewhat to the right.

The digital compression is best and most readily *made by the middle* and forefinger of one hand, beneath *which a small pad* of lint should be placed, reinforced

by the pressure of the fingers of the other hand. Pressure on the inferior cava trunk must be avoided as much as possible.

The umbilicus is sometimes given as a landmark for the vessel, but investigation has shown that its place is so variable, that it should not be taken as a trustworthy guide.

In some cases a moderately small hand, well oiled, can be introduced into the rectum, and pressure may be made upon either the *common or internal iliac arteries* by the fingers.

This procedure is not, however, a common one. In the first place the introduction of the hand has to be performed under an anæsthetic, and very gradually, so that it is of little use upon an emergency; and secondly, the general belief is that the operation is one attended by considerable risk of damage to the gut and its coverings.

Possibly, however, this mode of compression might be found useful in some rare cases of primary or secondary hæmorrhage from the sciatic or gluteal vessels, in a diffuse gluteal aneurysm, or some analogous hæmorrhage, but no dresser should attempt the operation of the introduction of the whole hand into the rectum on his own responsibility.

Compression of the *Common Femoral artery*, as it lies over the arch of the pubes, is frequently required. In this situation the circulation may be completely controlled by making pressure directly downwards, *i.e.*, at right angles to the surface, midway between the pubic symphysis and iliac spine.

Care must be taken to avoid pressure on the vein as far as possible; this is best done by putting a small pad of lint underneath the finger. Frequently, however, the vein is so far behind the artery, even when they come through into the thigh, that it cannot escape the pressure.

The inguinal glands too, as they lie parallel with Poupart's ligament, must be avoided, and if they are *enlarged, this is* sometimes very difficult.

The line of the *Superficial Femoral artery* is one taken from the point above mentioned, between the symphysis and spine, and the inner side of the internal condyle of the femur.

When the knee is slightly flexed, and the thigh rotated outwards, firm pressure all along this line will generally succeed in stopping the current of blood, but as the artery gets deeper in its course, more and more force will be required; the artery, also, cannot be pressed directly against the bone.

As in the case of the brachial artery at the bend of the elbow, so with the popliteal, digital compression is very inefficient, while the circulation may be readily stopped by flexion. If a firm pad, about the size of a hen's egg, be placed in the hollow of the knee, and the knee be then bent up on it, the circulation will be quite stopped.

By any means short of complete strangulation of the limb, it will not be found possible, as a rule, to compress either the *anterior or posterior Tibial* vessels in the leg, but the posterior one becomes quite superficial as it lies a little internal to the middle of the hollow between the heel and the inner ankle, going with the nerve beneath the annular ligament, between the common flexor of the toes, and the special flexor of the great toe.

The Dorsal artery of the foot, the continuation of the anterior tibial, may be felt and compressed against the astragalus, scaphoid and cuneiform bones, between the extensors of the big toe and of the other toes.

(2,) *By Strangulation of the Limb.*

The process generally known by the name of Esmarch's bloodless method, consists in first of all emptying the limb of its blood, by rolling a long india-rubber bandage, from below upwards, to the spot where the circulation is wished to be controlled. At this spot a stout indiarubber tube two feet long, with a *hook* at either end, is passed round the limb, sufficiently *tight to strangulate* all the vessels, and the ends of the *tube are then hooked* into each other. (Fig. 76.)

The indiarubber bandage is then removed, and the limb, thus rendered bloodless, will remain so until the tube is taken off.

This method is simple enough, and with ordinary care all chance of bleeding is prevented. It is especially useful in such operations as the removal of sequestra, scraping or gouging carious bone, etc., where it is important to have the exposed

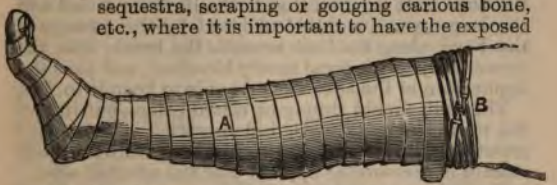


FIG. 76.—*Esmarch's Bandage and Tube applied.*

parts as dry and bloodless as possible ; but it will also serve in the place of a tourniquet in amputations, or in other cases where it can be applied at some little distance from the seat of operation.

The strangulation by this method is so complete, veins, arteries and capillaries being all compressed, that it is not safe to allow the tube to remain on long.

Its use, therefore, is not fitted for the restraint of accidental hæmorrhage, except as a temporary measure, and indeed in a very prolonged operation it is wise to remove the tube before the operation is finished.

When the Esmarch's bandage has been used in an operation, and only general oozing is expected to occur in the wound, it is generally convenient to apply the dressings, using such pressure as may be required, *before* the tube is taken off, for the absolutely bloodless condition of the small vessels has caused a temporary loss of tone in their walls, so that when the blood current is allowed to flow into them again, they for a time are much dilated, the whole limb becomes injected; and unless the wound has already been bandaged up, and pressure applied, there may be a very brisk *flow of blood*, and a corresponding delay in the dressing.

This applies only to the smaller vessels, and arteries large enough to give trouble should be secured by forceps or ligature before taking off the tube.

There has been latterly an increasing desire to simplify Professor Esmarch's procedure, and to do away with the indiarubber bandage, while retaining the tube. It is found that if the limb be raised and the larger veins emptied of blood by the passage of the hand along the limb towards the trunk, that the former may be rendered nearly bloodless, and that the application of the tube alone is able to keep it so.

The limb should simply be raised before putting on the tube in cases of septic inflammation or malignant growth, as morbid products may be forced into the blood stream if pressure be applied over the affected area.

The tubes used for encircling the limb should always be tested before they are used, for they are very liable to crack or break unexpectedly, especially at the ends, where the hooks are fastened.

In cases of operation about the shoulder, the hip, or the gluteal region, the tube may very usefully be put on in the form of a figure of 8, and in this way even such operations as amputations at the shoulder or hip joints have been rendered almost bloodless. The plan succeeds best where there is much emaciation.

(3.) *By Tourniquets.*

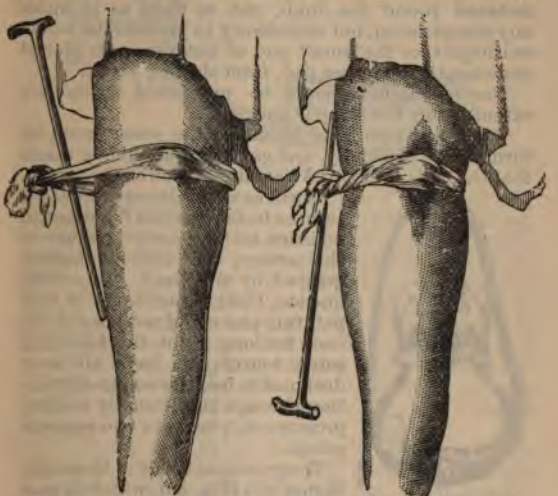
A tourniquet is, properly speaking, an apparatus for screwing down a pad upon a vessel. Practically, however, the term is applied to any means by which pressure may be put upon a vessel and mechanically maintained.

The principal forms, which alone will be described, may be roughly separated into three classes—improvised, screw, and india-rubber, or elastic, tourniquets.

The improvised tourniquet is an efficient and ready improvement on the time-honoured method of stopping *bleeding from* any part by tying something round it, *somewhere between* the wound and the heart, tightly *enough to strangulate* all the tissues.

In the improvised tourniquet especial pressure is put upon the main artery, and therefore the force required is very much less, and the venous return is at least not wholly obstructed.

Its manufacture and application are simple enough. A handkerchief is taken, folded up like a cravat, and a piece of cork or wood, or a pebble, is inserted between the folds, so as to act as a pad. This pad is placed over the artery, and the cravat *loosely* knotted round



FIGS. 77 and 78.—*The Improvised Tourniquet or "Garrot."*

the limb, the knot coming on its outer side. (Figs. 77 and 78.) An umbrella or ruler, or any moderately strong rod or stick is then passed between the limb *and the knot* and twisted round. The leverage thus

obtained is very great, and it is far more easy to err on the side of too much compression than of too little.

This form of tourniquet is known also by the names of "The Garrot" or the "Spanish Windlass."

Of screw tourniquets, the oldest form which is still retained in use is known as Petit's.

Its action and method of application can be readily enough seen from the woodcut. The strap is first fastened round the limb, not so tight as to make any compression, but sufficiently to prevent the whole tourniquet, or the small pad of lint generally placed underneath the larger pad, from shifting about.

The tourniquet should be unscrewed to its full extent before the strap is buckled.

When pressure is to be made, the screw must be turned very gradually, and great care should be taken that the pad never shifts from its position on the artery.

FIG. 79.—*Petit's Tourniquet* (modernized).

It will be noticed that in this pattern, as in the Spanish Windlass, in addition to the especial pressure on the artery, the limb is tightly grasped by the strap. In consequence, Petit's tourniquet is very painful, and could not possibly be used for long. But the following screw tourniquets have all been designed to free the venous circulation through the limb, by making pressure only between two opposite points.

The principal forms of these are, Signorini's (Fig. 80), which is easy of application but is liable to slip round the limb; Carte's, or Skey's, (the safest pattern, Fig. 81) is for the vessels of the thigh, and Lister's for the abdominal *aorta.*

An effective tourniquet for the subclavian artery is still much to be desired.

With regard to the use of these tourniquets, the localization of arteries has been sufficiently dealt with; in all the pressure should be made very gradually, and

FIG. 80.—*Signorini's Tourniquet*

either a small pad or the finger should be placed over the artery itself, underneath the pad of the instrument.

The compression of the abdominal aorta by Lister's instrument is in itself a serious proceeding, apart from the operation to which it is an adjunct. Some, at any rate, of the important abdominal viscera must be appreciably compressed, and it seems impossible to make sure of avoiding such organs as the main branches of the solar plexus, the pancreas, and intestines, injury to which might well cause a collapse even more serious than that which the instrument is designed to prevent.

For these reasons this tourniquet is not frequently used now. The best way to apply it is for the patient to lie on the right side, while it is put on and roughly adjusted; in this way the great part of the intestines, etc., escape the risk of pressure. The patient then lying on his back, the artery must be found as mentioned before, and pressure made extremely slowly.

In addition to the elastic band used in Esmarch's method, which has been already described, a solid *india-rubber* cord fitted into a groove in an ebonite or

wooden compress may be used. It is portable and readily applied, but is somewhat liable to slip; there are two or three patterns on this principle.

FIG. 81.—*Skey's Tourniquet.*

(4.) *By Heat or Cold.*

The application of cold to a bleeding part has always been recognized as one of the most valuable means of arrest. Free exposure to the air is often alone sufficient to promote coagulation of the blood, and constriction of the blood-vessels. This may be seen in cases of recurrent hæmorrhage, after an amputation or any other large cutting operation when, a few hours after the operation, the wounds or the flaps become distended with blood, which may be dripping away at quite an alarming rate. In such a case, if the flaps be opened and the clots cleared out, so that the air can get to the surface of the wound and to the ends of the vessels, the bleeding will very probably cease without anything further being done, provided of course that no big vessel has been overlooked.

Should exposure to air not be enough, cold water or ice (the latter especially) may be very powerful *styptics*. A lump of ice applied to a bleeding surface *may cause an artery*, nearly as large as the radial at *the wrist, to contract* and cease to bleed.

Another very efficient way of applying cold is by

means of the ether spray. The effect of this spray should not be pushed so far as to cause the parts to be absolutely congealed, if this can be helped, for they become very painful on thawing, and the blood vessels being partly paralysed the bleeding is apt to recur.

As a converse to this method of freezing, another way of stopping general oozing is too rarely employed in this country, namely by the application of a flannel wrung out of water as hot as can be borne by the skin, *i.e.*, about 120° F., but not so thoroughly as to be quite dry, and applied immediately. This should be pressed on the bleeding surface (*e.g.*, to an amputation flap) for a few seconds. On its removal, the tissues will have a whitish look and the hæmorrhage will have all but ceased. The mode of action would seem to be a direct stimulation of the vaso-constrictor nerves, or perhaps of the musculature of the arterioles, as a temperature of 100° to 105° is known to produce a tonic contraction of muscular tissue.

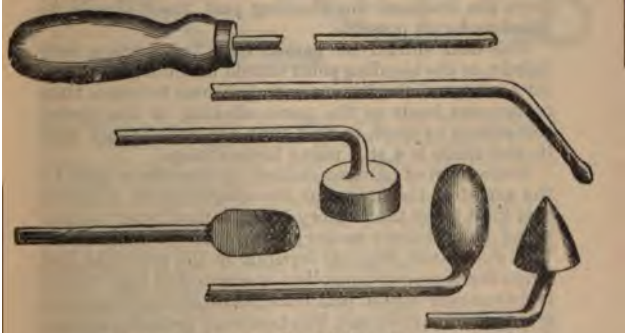


FIG. 82.—*Examples of Cautery Irons.*

The principal forms of apparatus for the application of the actual cautery are the old cautery irons, the *galvano-cautery*, and Pacquelin's thermo-cautery. Other

forms there are, such as the gas cautery of Dr. Bruce, but they are not now in general use.

Cautery Irons (Fig. 82) are still frequently employed to stop bleeding, or for other purposes of cautery. They, however, are gradually being displaced by the newer forms mentioned above.

These irons are of precisely the same shape and size as they were in the days of Scultetus, or still further back. They consist of pieces of iron with ends of various shapes, themselves of iron or copper, set into ordinary handles; they, indeed, are just like a white-smith's soldering iron, ending either in a point or a "button," a straight or bent "olive," etc., and the best way to heat them is to put them into the fire.

The most efficient heat for the arrest of bleeding is just a visible red, not glowing, but still plainly red hot. If this heat be exceeded, the iron begins to cut rather than sear the tissues. The iron should be wiped clean from the fire, and the bleeding part itself should be dried as far as possible.

The iron should be passed over the surface very lightly, or the bleeding point should be quickly touched, for contact of the tissues with the iron for more than a moment leads to the parts sticking to the metal, sometimes so much so that they are pulled away with it, and there is a still worse hæmorrhage.

Some form of galvano-cautery is sometimes used for the arrest of bleeding, but the employment of either this kind, or of the cautery irons, is now largely superseded by a thermo-cautery known as "Pacquelin's." This apparatus (Fig. 83) depends on the principle that when the vapour of benzoline or some other high olefine is driven over heated platinum, its rapid incandescence is sufficient to maintain this heat very perfectly indeed. In the figure it will be seen that with an ordinary Higginson's syringe and safety ball to give a continuous *blast, atmospheric* air is blown over the surface of the *benzoline, and then,* being saturated with its vapour, *passes on through* the tube and through the holder, and

thence into the air through the platinum point, which contains some spongy platinum.

The platinum point having been first heated in a spirit flame until it just begins to glow, the ball of

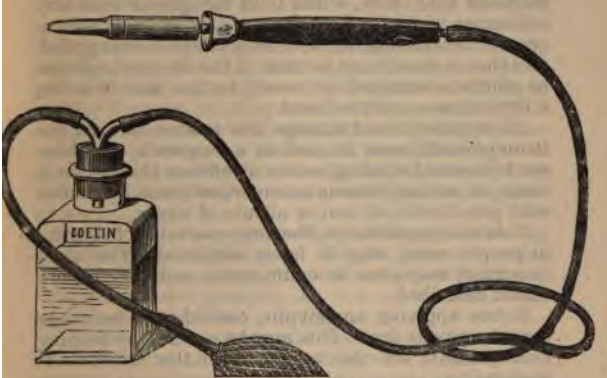


FIG. 83.—*Pacquelin's Thermo-Cautery.*

the syringe is worked by hand, and the air, charged with benzoline, undergoes active combustion as it passes through the point, and thus not only maintains its heat, but increases it to whiteness.

The readiest way to heat the platinum is to use the spirit lamp as a blow-pipe flame, for which it is generally arranged, and, as before, the heat to employ as a styptic is a dull, almost invisible red.

(5.) *By Styptics.*

These are substances which, when applied to a bleeding surface, tend to staunch the blood. This they may effect in two or three different ways; thus, they may simply form an artificial scab over the surface, or they may condense the tissues and astringe the vessels by *combining* with it and coagulating the albumen *present; or* this condensing action on the tissues may

be powerful enough to destroy their vitality, and so by these "caustics" a destruction comparable with that of the actual cautery is produced.

The use of styptics was, in former times, far more frequent than now, when it is recognised that any substance which is either caustic, or strongly astringent, inflicts damage to the tissues to which it is applied, and that it should not be used if the hæmorrhage can be otherwise arrested, or merely for the sake of saving a little time or a little blood.

All styptics do not damage the tissues, but all the more powerful ones do, and to a surgeon's eye there are few more irritating causes of offence than to see a clean cut wound, or some unimportant graze, blackened with perchloride of iron or nitrate of silver.

This being understood, the immense value of styptics in proper cases may be freely admitted. The most important may here be enumerated and their application described.

Before applying any styptic, care should be taken that the part is dry. This may be ensured by keeping firm pressure on the wound until the moment of application.

Mechanical Styptics.—The dried leaves of "Piper Angustifolium," or the Matico plant, are imported from Peru, and have a peculiar cobweb-like down on their under surface. Some astringent principle is also contained in the tissue of the leaf.

If the under surface of the whole leaf be applied to a bleeding part, or if the leaves, ground up into a powder, be dusted on it, the fine downy filaments will, with the blood, form a firm adherent scab, and the bleeding will be staunched. This mechanical action is probably the beginning and the end of the "marvellous" action of matico. The infusion or powder taken internally is quite harmless.

In precisely a similar fashion does the domestic remedy act, of gathering as many cobwebs as can be quickly collected, and putting them over the surface; and, indeed, although the remedy may seem too homely

for the surgeon to use, of its efficacy in staying a brisk capillary oozing, none who have tried it will doubt.

Collodion, prepared by dissolving one ounce of gun cotton in a mixture of thirty-six ounces of ether, and twelve ounces of rectified spirit, is extremely useful in cases of wounds about the face, in which, if a scar has to be avoided, the edges have not only to be brought together, but must be held together firmly enough to prevent blood being effused between them. This is readily done by painting three or four coats of this collodion over the wound with a camel's hair brush, or better, by placing over the wound one or two layers of gauze, and painting these with the collodion. The collodion, as it dries, contracts, and thus the required pressure is kept up.

Flexible collodion, prepared by adding to six ounces of collodion, two drachms of Canada balsam, and one drachm of castor oil, may be used instead of the above. It is not so liable to crack, but it is not so contractile as ordinary collodion.

The next three styptic substances on our list are all astringent, but not at all caustic, that is they do not produce any sloughing. They all are said to coagulate albumen, on which property, *plus* their effect on the blood vessels, their styptic action depends. Their application does not necessarily prevent healing by the first intention. These substances are *Oil of Turpentine, Creasote, and Hazeline.*

Of these, the first two may be "dabbed" on the bleeding surface with some lint. The third may be applied as a lotion, or a pad of lint soaked in it may be placed on the wound.

It is worthy of notice that all three substances are stated to be powerful hæmostatics when taken internally.

We come now to styptics which, when solid, or in concentrated solutions, are more or less caustic. The most convenient way will be to take them in order of their causticity.

Sulphate of Copper and Sulphate of Iron are both,

in the crystalline state, slightly caustic, as well as highly astringent, and they are often found very useful in both capacities. Thus, spongy and bleeding granulations may be rubbed over with the crystals, as may also a leech bite or a bleeding gum. In solutions of various strengths they lose their caustic character, but remain highly astringent, and are used then as local applications in cases of relaxed mucous membranes, fungous granulations, etc.

The *Perchloride of Iron* has quite a specific power as a local application to stop bleeding. The bleeding part may either be touched with the solid salt, or the liq. ferri perchloridi fort. (P.B.) may be brushed over them, or, probably best of all, strips of lint soaked in the same solution may be used to plug the wound or bleeding cavity.

The solid perchloride may also be powdered and dusted on the bleeding surface, while lotions of different strengths, made by diluting the liquor ferri perchloridi, may be used as astringent and hæmostatic applications to the nose, urethra, vagina, uterus, etc. In the concentrated forms this iron salt seems to act by forming a particularly firm spreading clot, it also coagulates the tissues, causes the blood vessels to greatly shrink, and forms clots within them. The parts which are actually in contact with the strong perchloride will die and be cast off in the course of a few days.

Efficient as this styptic is, it is very disagreeable. The intensely astringent taste renders it particularly unpleasant in all injuries about the mouth, and the discolouration and apparent foulness of the wound to which it has been applied, combined with the delay in healing which its use entails, lead most surgeons now to reserve its employment for a last resource, when its value cannot be over-estimated.

Alum and *Tannin* in powder are astringent, somewhat escharotic, and rather powerfully hæmostatic. They have a similar action when taken internally, the tannic being changed into the gallic acid. These

styptics are commonly applied to bleeding parts in the form of powders, dusted on, but they are still more frequently used as mild escharotics for growths, such as condylomata. The dried alum (A. exsiccata) which has been deprived of its water of crystallization, is the more powerful.

Nitrate of Silver or "lunar caustic" combines with the albumen of the tissues, and when applied in the solid form produces a superficial slough, which is limited in depth, for the silver and albumen compound is hard and dense, and prevents any excess of the caustic that may be present from causing the cauterization to be too deep. To this fact its value to a great extent is due.

Lunar caustic is applied in the form of a moulded stick, pointed like a pencil, and held in a metal clip. Its application is almost painless. The point of the stick has but to be held firmly against the bleeding point (*e.g.*, a leech bite, or a dog's bite) for about five seconds, and the bleeding will almost certainly be arrested. It is not suitable for application in this form to a large bleeding surface. This substance is sometimes "mitigated" by the addition of some inert substance, but it is not then used as a styptic, nor are its solutions.

Some Special Kinds of Bleeding.

We will here mention one or two especially troublesome or peculiar kinds of bleeding, with the best methods for their arrest in the first instance.

Wounds of the scalp often bleed very freely at first, but the flow of blood may always be arrested by firm pressure applied directly to the part, which should first be washed and shaved. A compress of lint, graduated or not, as preferred, should then be applied, and pressure made over it with a twisted or knotted bandage (Fig. 28). The pad should not remain in position more than twenty-four hours. It is never wise to plug the wound with strips of lint.

Wounds of the Palmar arch are very troublesome,

bandage being placed on the wound, it will not recur while the patient is lying down.

If, however, the patient *must* walk soon after he has had a burst vein, the leg and foot should be firmly bandaged from the toes upwards, to a little above the bleeding point, on which there must first have been placed a pad and bandage. It is also necessary to keep the patient warm; the loss of blood is often very great, and patients such as these cannot bear it well, so that it sometimes happens that after the bleeding has been stopped, they get a sudden failure of the heart's action, and die because they have been allowed to get too cold.

Nose bleeding is either idiopathic or traumatic, and is venous and capillary in character. It is of all kinds and degrees of severity, and may require for its arrest a number of expedients, some very simple, some requiring considerable skill.

But it is often desirable not to check the bleeding at all, as when it occurs in children in good health, and young adults of a lusty habit; or in some cases in young women in whom the hæmorrhage is vicarious to the menstrual flow.

Idiopathic epistaxis may be roughly divided into two classes; the one in which it depends on simple congestion of the mucous membrane of the nose, occurring in healthy people, and the other in which it results either from passive congestion caused by cardiac disease, or from diseased conditions of the vessel walls.

The hæmorrhage in the first class tends to stop of itself, when, by the bleeding, the congestion is removed; but in the second the cause is constant, and the longer the epistaxis goes on, the more difficult it is to stop. The bleeding in these cases is not a brisk flow accompanied with a good pulse and other signs of a strong circulation, but is rather a feeble dribbling, sometimes stopping altogether, and then becoming again a little more rapid. In this way a great deal of *blood may* be lost by those who can ill spare it, and *the bleeding, instead* of being a relief, is accompanied *by great depression*, a feeble fluttering pulse, shallow *respiration, etc.*

A little experience of the aspect of sick people will enable the student to recognise those who are suffering from visceral disease, whether it be morbus cordis, or cirrhosis of the liver, or chronic Bright's disease, or a malignant growth, and to sharply separate in his own mind those in whom moderate epistaxis is rather a relief, from those in whom it is certainly an alarming symptom, and may be a source of danger. In these latter it should always be promptly checked; in the former, delay is never hurtful and may be useful.

The expedients for checking epistaxis are very numerous, and are best described in order of their importance and as, in practice, they should be employed; the simpler measures being always tried before those which cause discomfort or pain.

In the first place, *position* is as important in these cases as in any. The patient's head should never be bent down over a basin, nor should the circulation be stimulated by his remaining standing. The best position is the sitting one, with the head thrown back. A towel, spread in front like a bib, will prevent the clothes being soiled, and, moreover, will obviate that constant blowing and wiping of the nose, which is most harmful.

If, in addition to this position, the venous return to the chest be promoted by everything being made quite loose round the neck,* in very many cases nothing further need be done, and an epistaxis, which has perhaps lasted two or three hours while the head was held down over a basin, will stop in as many minutes. If not, the next thing to do is to raise the arms above the head, or to rest the hands on the top of the head. This has a very good effect, probably by increasing the chest capacity, and thus lowering the intra-thoracic blood pressure in the right heart and the large venous trunks.

The application of *cold* externally is the next expedient. Ice, or a cold evaporating compress is recom-

* It may be worth while to remind the reader that the collar of the jersey may be tight, while that of the outer shirt looks quite *loose*. *In the* case of women it is also wise to loosen the stays.

mended to be put over the bridge of the nose, but it is very doubtful if this does any good. But cold applied to the *nape of the neck* is, undoubtedly, a very powerful agent for arrest. Slipping a door key down the back is therefore no mere superstition, but its good effects are better secured by an ice-bag fastened over the upper cervical spine.

If these gentle measures have failed, we must proceed to more vigorous ones in the form of local applications to the bleeding part.

The nostrils may first be syringed out with iced water, using a common syringe, or, better, one of Higginson's pattern, or a nasal douche (Fig. 85). In using the latter, the water should be forced into one nostril, so that it can flow round the posterior nares, and come out at the other. This is effected by keeping the mouth wide open, so that the soft palate is raised.

FIG. 85.—*Nasal Douche.*

Instead of iced water, some of the milder styptics may be used, such as a solution of alum of the strength of one or two teaspoonfuls to the pint of water. The best local application is, however, Hazeline, which may be sniffed up the nose in full strength, or applied in any way that seems most convenient. Perchloride of iron, on account of the discomfort and irritation it gives rise to, even in weak solutions, is not to be recommended.

Epistaxis may be checked also by the use of solid astringents, as powdered alum or tannin, used as snuffs. The powder, when placed in a paper, folded so as to make a trough, is "sniffed" strongly up the nose. This is a very irritating and disagreeable proceeding, and is not to be recommended if other means of arrest are at hand.

In cases of continued failure, we fall back on the last resource of plugging the bleeding nostril; for digital compression of any external artery is obviously useless, and compression of the nostrils can only be useful in very superficial hæmorrhages, which are not common.

The nostrils may be plugged, either from the front alone, or by completely shutting up the nasal cavity on one or both sides, by plugging the posterior as well as the anterior nares, or by means of a nasal tampon or inflating bag.

Plugging from the Front alone. We believe that if this operation be thoroughly performed, it will not often be necessary to resort to the disagreeable and not altogether safe practice of plugging the posterior nares. To plug from the front, a strip of gauze at least 18 inches long, and a stiff director are required. The strip may be dipped in perchloride of iron solution, or in carbolic oil, if it be thought desirable (the latter is very useful to prevent decomposition), and must then be packed right back to the posterior nares, and the full length of the floor of the nose must be borne in mind.

The back part being well filled, the more accessible

parts of the cavity are plugged easily enough, the strip of lint being gradually coiled away until the whole nostril is full.

By far the best method of controlling epistaxis is by means of Rose's *Epistaxis plug*. This consists of a thin india-rubber bag fixed into a central stem, by which it is introduced collapsed into the nasal cavity. Attached to the central stem is a ball syringe, by means of which the india-rubber bag is distended. In this way a firm even pressure is exerted on the nasal mucous membrane, and the hæmorrhage in most cases readily controlled. It is obvious that this distended rubber bag will fill out the inequalities of the nasal cavity more successfully than can be managed by any method of plugging with lint or gauze. The plugging of the posterior nares with pledgets of lint is a proceeding fraught with considerable risk, and should only be adopted as a last resource.

To plug the Posterior nares, a "Belloc's sound," or some substitute for it, will be required, and two suitable little plugs fashioned to fit the anterior and posterior nares respectively. They are best made of lint, tightly rolled, so as to make two cylinders about an inch long and half an inch wide. The one which is to go into the posterior nares must be tied round the middle with a piece of string, so that two ends, not less than a foot long, hang from it in front, as in the figure (Fig. 86), while another piece, not shown in the illustration, should be fastened to it behind, so that when the plug is adjusted into the posterior nostril, this may lie in the pharynx, ready to be brought forward out of the mouth when the plug has to be removed. These being ready, the sound, consisting of a cannula within which is a piece of watch spring, which will curl round the soft palate into the mouth on being pushed out of the tube, is introduced along the floor of the nostril which is bleeding. The watch spring is protruded, *and is hooked* forward by the forefinger of the left *hand into the* mouth, and *both* ends of the string, *which are* attached to the plug of lint, are quickly

passed through the eye, which will be found at the end of the watch spring. This is then retracted into the cannula, and the latter, when withdrawn through the nostril, will carry the strings with it.

The strings must now be separated from the cannula, and drawn through the nostril. The plug will thus be drawn into the mouth and carried backwards to the soft palate; it must then be passed behind this with the fingers, and pushed upwards into the upper part of the pharynx, and traction being made on the strings, it can be adjusted by the fingers to fit into the proper opening of the posterior nares. This being done, the other plug is adjusted into the anterior nostril, *between* the ends of string, which are firmly tied over it and fasten it tightly to the nostril, now become a shut cavity.

FIG. 86.—*Section through the head, showing Nasal Plugs in position with Belloc's sound.*

The principal difficulties in this plugging operation are, first, the introduction of the sound and the bringing forward of the watch spring, and secondly, the adjustment of the posterior plug. It is often awkward to pass it round the soft palate; but this being done, the rest is easier. Still, it is not difficult to mistake the opening into which the plug is to be placed, and to avoid this, the fingers must be passed right back, and the nostrils thoroughly explored.

Difficult as the application of these plugs may be, *once applied, it* is impossible for bleeding to continue.

Unfortunately, it is not safe to retain them in position long, thirty-six hours being probably the outside limit; necrosis of the palatine bones, extreme fœtor, and blood poisoning being apt to occur.

It is very rarely indeed that the *Socket of an extracted Tooth* bleeds to any troublesome extent, considering the enormous number of extractions performed. When it does happen, it is almost always in patients who are either in very feeble health, or else who are affected with some form of the hæmorrhagic diathesis.

Sometimes, indeed pretty frequently, the socket of the tooth goes on bleeding for some hours, in consequence of the nutrient vessel being unusually large, or unable to contract. In such a case the bleeding comes from one or two points, and is not at all dangerous. In the really serious cases, from the whole gum and lining of the socket there appears a general welling up of blood, and this is sometimes hard to check. Reliance must be placed on conscientious plugging, and the actual cautery.

In plugging, gauze is the best material. Only when inefficient by itself is it necessary to impregnate it with some styptic, such as turpentine, carbolic acid, creasote, or alum. In any case it must be packed away very firmly indeed, filling the whole socket, and a little more, so that the plug may be kept in proper position by the opposite tooth, if the jaws be closed with a four-tailed bandage.

Another plan is to *replace the extracted tooth*, if it has been kept, and this often answers very well, as does also a plug of gutta-percha, moulded and pressed into the gap. Every surgeon, however, may come across cases in which the repeated hæmorrhages are endangering the life of the patient, from even such a trivial cause as this. These extreme cases will generally be found to be associated with well-marked hæmorrhagic diathesis, and in many instances constitutional treatment has been found a most important accessory to local measures. Probably, of these latter, some form of the actual cautery will be found the most useful.

Recurrent, or reactionary hæmorrhage, is that form which comes on as soon as the period of lowered cardiac action and partial collapse, which is occasioned by the shock of an operation, or an accident, passes off, *i.e.*, within four or five hours of the injury. By this time, too, the contraction occasioned by the exposure and division of the vessels, has largely passed away. There is then present a condition of increased cardiac activity and relaxed vascular walls, so that it is not surprising that very frequently there is free general oozing from a wound which, at the time it was done up, appeared quite dry. The bleeding is chiefly capillary, or proceeds from small arterioles, which had been so firmly contracted as not to declare their presence at the former examination. Now, too, larger trunks which have been tied, but not very firmly, may burst their bonds and bleed freely.

If this be slight, as it often is, the serum and blood will remain within the aseptic dressings, and will do no harm. If it show outside and continue to drip through, the dressings must be undone and the wound exposed. Firm pressure should then be tried. If the wound be in the course of a limb, this should be raised and firmly bandaged. Should the hæmorrhage still go on, the wound must be opened up and the clots cleared out; it will then be seen whether the hæmorrhage proceeds from any vessels requiring torsion or ligature, or whether it is purely capillary. If the former, the vessels must of course be secured; if the latter, the clearing out the clots will have had a very good effect, and this, with a few minutes' exposure to cold, or the application of hot water (see page 133) will be sufficient to arrest the bleeding. The wound must then be redressed and put up rather firmly.

As strict aseptic precautions should be taken in all manipulations for the control of reactionary hæmorrhage as were employed in the primary operation.

It must be recollected that a smart reactionary hæmorrhage, and the means taken for its arrest, may *be sufficient* to cause a collapse, similar to the original

one. The bleeding will then cease as it did before, and from the same causes, and it may also be succeeded by a reactionary state, sufficient to cause a further loss of blood.

In these cases therefore, after reactionary hæmorrhage has once occurred, the patient should be watched.

The constitutional symptoms of hæmorrhage and their treatment. As the result of loss of blood, the patient becomes giddy and faint, and if the amount is considerable, there may be loss of consciousness. The surface of the body is pale, cold, and bathed in perspiration. The pulse at the wrist is feeble and intermittent; the respiration is shallow and sighing in character. There is more or less complete loss of muscular power, and the sphincters may be relaxed, the patient voiding urine and fæces beneath him. As he recovers from the initial shock due to the bleeding, he becomes restless, tossing from side to side of the bed, and complaining frequently of great thirst.

Treatment. The patient must be moved very gently. On no account should he be raised from the recumbent position. His clothes should be removed, cut away when necessary, and he should be wrapped up in warm blankets. Hot water bottles should be packed round the body, and the bed should be so inclined that the head is lower than the feet. Great care must be exercised in the giving of stimulants. If the bleeding has occurred from some vessel that cannot readily be got at, and has ceased by natural means, brandy should on no account be given, unless death is actually threatening, for it is during this period of collapse that coagulation of blood within and around the wounded vessel is taking place; undue stimulation would disturb the clot. The restlessness of the patient must be restrained, and he should on no account be moved.

If the hæmorrhage has been controlled by ligature of the vessel or by other means, brandy may be administered in small doses at a time, as considered necessary.

The loss of blood may be so great that dyspnœa results, and the breathing may actually stop. In these cases artificial respiration should be adopted, whilst immediate means are taken to perform *transfusion*. Transfusion may also with advantage be made use of in cases where the symptoms have not reached such a severe stage. It consists in the injection into the veins of the patient of some quantity (two or three pints or more) of a saline solution. The use of blood is now practically given up, as its advantages over simple saline solutions are doubtful, its dangers far more than counterbalancing any possible advantages it might have. The method of transfusion of blood, moreover, is complicated as compared with that of the injection of saline solution.

For apparatus all that is required is a fine nozzle, preferably of metal, but a piece of glass tubing drawn out to a point will serve in an emergency, a piece of india-rubber tubing and a glass syringe or funnel. The solution used is that known as normal saline solution (·75 p.c. of salt), which may be prepared by adding a teaspoonful of salt to a pint of water.

The vein, preferably the median basilic, having been exposed, a double silk ligature is passed beneath it, a nick is made in the vein between the two ligatures, and the nozzle is introduced into the proximal part of the vein. It is tied in with one of the ligatures, the other securing the distal part of the vein. Before introduction the cannula and india-rubber tubing attached should be filled with the solution, a pair of forceps being used to close the end of the tubing, to prevent the escape of the fluid. The syringe is then introduced into the end of the tubing, and the solution, previously warmed to 100° F., is injected slowly into the vein. Or if a funnel is used, this is raised to such a height as will allow the fluid to run slowly in. Care must be taken that the apparatus is absolutely clean. The cannula and india-rubber tubing should be boiled *before use*, and the water, previously boiled, allowed *to cool down* to the temperature required.

CHAPTER IX.

Of the First Treatment of Shock, or Collapse, Fits, etc.

Shock, or Collapse. By Shock is meant that condition of general depression of vital activity produced by severe injuries or by emotional disturbances. It is the result of a depressant effect upon the central nervous centres produced by profound stimulation of peripheral nerves and nerve endings.

The severity of the shock will depend upon:

(1,) The extent of the injury. The severe collapse caused by an extensive superficial burn is a good example of shock caused by peripheral stimulation. In this case it is the extent of surface involved rather than the depth of the burn that determines the severity of the symptoms.

(2,) The nature of the part affected. Those parts most richly supplied with nerves, such as the abdominal viscera, will, when injured, give rise to the most profound collapse.

(3,) The nature of the injury. The form most likely to produce severe symptoms is a crushing force, which not only involves a number of nerves, but is most likely to severely irritate them.

The collapse may be much intensified, and, indeed, actually caused by such complications as exposure to cold and loss of blood. That due to loss of blood has been referred to in the last chapter.

The patient lies flat on his back, his limbs flaccid, and he makes no spontaneous movements. The surface of his body is cold and clammy, the face is *pale, and the eyes* are sunken. The pulse is small, *feeble, and irregular.* The respiration is shallow and *sighing in character.* The temperature commonly

falls to about 97°, but may fall as low as three or four degrees below normal. There may be nausea or vomiting. The sphincter ani may be relaxed, whilst the urine is retained. Consciousness may be more or less impaired, as shown by delay in answering questions, or incoherence of thought and speech.

In practice, the first thing to do when a patient is collapsed, is to get him to bed, between the blankets, and with the head quite low. Hot-water tins, or hot bricks, should then be put in the neighbourhood of the flanks, and between the thighs, care being taken not to scorch the skin, while the patient is too insensitive to complain. The further measures will depend upon the severity of the shock. In slight cases, when the feeble pulse steadily gathers strength and the respiration continues regular and becomes gradually deeper, few further measures can be taken which will be useful. Rest and warmth, and lying flat, will do all that is wanted.

Cases of a higher grade of severity are those where the patient can be aroused to swallow, and has a fair respiration and a perceptible pulse, but still, after a little watching, does not appear to be coming round, or may seem to be getting worse. The choice of a stimulant will depend upon the degree of shock. When slight, hot strong beef tea may be given with advantage. When collapse is more marked, sal volatile, ether, alcohol, or some other diffusible stimulant should be given in small doses, frequently repeated, and of these, sal volatile is probably the best. Brandy should not be too much diluted, and should be given in teaspoonful doses frequently repeated, say every half-hour, rather than in one large dose, until the pulse shows signs of improvement, and the patient's colour is improving, when it should be diminished or discontinued.

If the condition of collapse is being kept up by severe pain, as in cases of burn—some preparation of opium should be given.

Most cases of shock will fall under one of these two

heads, and with ordinary attention, in the absence of other complications, they will do well enough.

But more rarely, cases occur in which the collapse, the lifelessness, is much more profound, and then every exertion will be necessary to prevent the life going out altogether. In these, the respiration will be threatening to stop at every moment, or may actually have stopped, the pulse will be barely, or not at all, perceptible at the wrist, the temperature may be lowered three or four degrees, and the insensibility profound.

In such a case we must not wait for the natural breathing to stop, before artificial respiration is set up. The head should be placed well below the level of the legs and body; frictional warmth procured by hand rubbing; while the heart may be directly stimulated by a hot mustard plaster, or by a turpentine stupe, and the diaphragm by faradisation.

As soon as the patient can swallow, stimulants should be given, but the risk of choking an insensible person must always be kept in mind. If the patient is unable to swallow, stimulants may be administered by the rectum. A warm enema of beef tea and port, of each an ounce-and-a-half, may be given, or stimulants may be administered hypodermically. The effect of the hypodermic injection of 30 to 60 drops of ether, or of brandy, into the arm, is very striking indeed, and in many cases has undoubtedly saved life. The needle of the syringe should be pushed into the muscle, as "subcutaneous" injection of ether is apt to cause a troublesome slough. Even in cases of apparently total collapse it should be kept in mind that there may be only "suspended" animation, and it is right to proceed with all approved methods of resuscitation before pronouncing the condition to be hopeless.

Care must be exercised not to over stimulate when *the effect of the* collapse begins to pass off, and to leave *as much as possible to rest* and *warmth*. The collapse *will in any case* be followed by a reactionary period of

irritation, and generally of fever, and this may be much aggravated by injudicious treatment at first.

The general effects of extreme and sudden hæmorrhage are recognised as being to a large extent identical with those of true shock; nor do the two conditions differ generally in their treatment, except with regard to the question of transfusion, which we have already considered. Care must be taken in the administration of stimulants to cases in which the cessation of bleeding has occurred spontaneously. This point has already been referred to.

Concussion. By concussion is meant that form of shock which results from a direct injury to the head, whereby the substance of the brain is shaken up. As a result its functions are more or less in abeyance. In slight cases the patient may feel giddy and confused for a few minutes. In more severe cases he is motionless and insensible, or answers only when shouted at, relapsing again into insensibility. The general symptoms are identical with those that have been described under the heading of Shock. There is the same pallor, cold clammy skin, feeble rapid pulse, sighing respiration, and lowered temperature. The pupils are widely dilated. The insensibility may last for a few minutes only, or may persist for days.

In treatment, alcoholic stimulants should be carefully avoided. If stimulants are needed, hot beef tea given as an enema should certainly be tried first, whilst the warmth of the body is maintained by hot water bottles and friction. The diet should consist of milk only, and that sparingly. The bowels should be opened on the second day. Care should be taken that the bladder does not get distended.

No effort should be made to restore consciousness, but on the contrary, the shaken brain cells should be allowed the most complete repose, and darkness, silence, and such warmth in bed as may be necessary to promote recovery from the shock, are indicated. After the actual concussion has passed away, it is *always wise to* keep the patient quiet, with a simple

diet, and to avoid excitement and brain-work, for the remote effects of concussion may be serious, although the immediate stunning may have lasted hardly more than a few seconds.

Syncope. Inasmuch as faintness is due to partial cerebral anæmia brought on by failure of the heart's action, within certain limits the treatment is the same, whether the syncope be merely emotional, or be due to some more definite cause, as general exhaustion, cold, hæmorrhage, organic disease (especially cardiac valvular incompetence), or a combination of any of these.

As an example of the common fainting fit, we may take that form which occurs most commonly in young women or lads of feeble circulation. Such people, under conditions of bad ventilation, disagreeable sights or smells, fatigue, or of an empty stomach, are liable to attacks of simple syncope. They have a sudden feeling of nausea and giddiness, and fall unconscious to the ground. On examination there is found a marked pallor and moistness of the face, shallow but distinct respiration, a pulse just perceptible at the wrist, and a peculiar flaccidity of the limbs. The eyelids are half open and the lips parted.

Presently, if left alone, the colour will return to the cheeks, the respiration becomes deeper and sighing, the eyes will open, and consciousness will return.

Of a similar nature, but even more transitory, is the purely emotional form, which occurs in perfectly healthy, strong people. Thus, grown men often faint on being vaccinated, or at the sight of blood.

Although none of these forms of syncope are dangerous, it is well that the attack should be as short as possible. The great agent in the recovery is an improvement in the cerebral circulation, and the best way to effect this is to make the brain the lowest part of the body. The patient must therefore be kept lying down (the position naturally assumed), and in every *way freedom of* respiration and of the circulation must *be attained.*

External stimuli, such as smelling salts (not too

strong), the sprinkling of cold water on the head, slapping the hands, etc., must be resorted to, but stronger stimulation, as faradisation, is not required. Fainting may often be prevented if the patient be sitting at the time of the attack, by making him lean well forward, so that the head comes almost between the knees, and thus receives a good blood supply. Perhaps, too, the aorta is partly compressed by the flexion.

But although the milder kinds of syncope are not alarming, faintness may be a condition of the greatest danger, and is indeed one of the most frequent actual causes of death. We have examples of such extreme syncope as an effect in great exhaustion, from exposure, or in starvation; or it may be due to the exhaustive effect of some severe illness.

If these cases be left to themselves, they will often insensibly drift onwards into death, and active measures must be taken to prevent this. The actual details of treatment will differ according to the particular cause in each case, but in almost all respects they are identical with those for extreme hæmorrhage, or for shock, or for drowning; namely, lying flat, warmth, stimulation, injection of ether, etc. In addition, in very severe forms of syncope, it is often useful to *invert* the patient, so that the head is the lowest part of the body. This is most conveniently done by placing the legs on a couch, and the head and shoulders on the floor. (This method of resuscitation is called "Nélaton's.") Artificial respiration, faradisation, and auto-transfusion, *i.e.*, emptying of the limbs of blood by hand rubbing and elevation, may all be sometimes required.

Hysterical Fits. Although no two of these attacks are alike, there is rarely any difficulty in the diagnosis; indeed, it is only when the attack exhibits the more serious characters of what is termed *hystero-epilepsy*, that any doubt can arise. In ordinary cases, the flushed tearful face, the panting breath, the emotional *laughter or sobbing*, the jerking movements, not truly

convulsive, and the almost invariable termination in a flood of tears, and (though this is naturally not so evident) a profuse secretion of almost colourless urine; all these points are characteristic of the hysterical attack, and could not occur in a real fit.

Moreover, if there be any doubt, analysis of the symptoms will show that the condition is a mimicry of graver disease, and that there is a "contrariness" in the behaviour of all these patients, which is very characteristic. Try to open the eyes, and they will be screwed up; or the mouth, and the teeth will immediately be clenched; the tongue, however, never being bitten. So, if an effort be made to sit the patient up, she will immediately flop down on the floor, but in doing so will give a further evidence of the nature of the attack, for in falling, even though there be apparently a loss of consciousness, the patient will carefully guard herself against injury.

Apparent unconsciousness is often present, and a kind of anæsthesia, so that needles may be run deeply into fleshy parts without eliciting a sign of pain; yet both these states are really deceptive. The anæsthesia is the result of an exaltation akin to the ecstasy of a flagellant, and the unconsciousness is only on the surface. In fact, as in the conditions of hypnotism (which in many other respects resembles hysteria), there is quite an abnormal intelligence of surrounding affairs. No hysterical woman, though she may be to all appearance profoundly unconscious, would ever allow anyone to cut off her hair. Moreover, while this emotional condition lasts, patients are very completely "*en rapport*" with the states of mind of those around them, and promptly become much worse, or speedily recover, according to the behaviour of the bystanders.

Although we have said that the symptoms are a mimicry of other disease, no greater mistake can be made than to treat these sufferers as malingerers. The *illness is real* enough, although it is a moral, rather *than a physical* ailment; and although the symptoms *are not genuine*, the object to be attained is to cut the

attack as short as possible, and to diminish the chances of its recurrence. On the one hand, the tendency to recur will be increased if the symptoms are treated as if they were signs of a grave mysterious illness, and on the other, the severity of the present attack will very likely be aggravated by harshness or rough treatment. The "bucket of cold water" we believe to be always harmful, but so is the other extreme of profuse sympathy, mixed with restoratives, such as sal volatile or chloric ether, or with comforting glasses of hot brandy and water.

As we have stated before, hysterical people may be quite trusted not to hurt themselves, so in almost all cases the best thing to do is to leave them alone. Nothing conduces more to a quick recovery than that the patient shall be convinced that her condition is one which excites no alarm, no pity, and no anger; and bearing in mind how hyper-sensitive these patients are to external conditions, all fussy friends should be rigidly excluded. Indeed, there is no necessity for anyone to remain in attendance, and if the patient be simply laid on her bed at the commencement of an attack, and left to come out of it as soon as she will, nothing better can be done.

A mixture of hysterical and alcoholic excitement is not uncommon in hospital casualty rooms. These cases again may be left to themselves or may often be more quickly restored to their right minds by a brisk emetic.

Apoplexy. By the term apoplexy is meant a sudden abolition of consciousness and power of movement due to a morbid condition of the brain. In popular language it is called a stroke. It is most frequently due to hæmorrhage into the brain, less commonly to an obstruction of the vessels to some part of the brain by a clot, which may be derived from a distant part (embolism), or formed at the spot itself (thrombosis).

But the apoplectic state or *fit*, from whichever of these causes it may arise, will present very much the *same symptoms*; namely, loss of consciousness without

failure of the heart's action, while, in the vast majority of cases, there will be evidence also of some local cerebral lesion in the shape of convulsive movements, or paralysis, or both, the paralysis generally remaining after the actual fit has passed; inasmuch as we have only here to consider the practical management of the patient during the attack, a differential diagnosis is not at all necessary.

Taking the case of an apoplectic fit arising from cerebral hæmorrhage, its course will be something like the following.

After a varying prodromal period, during which there may have been warnings, in the way of mental confusion, giddiness, etc., the fit proper generally comes on quite suddenly, often during some emotion, or some unusual exertion. The prominent symptom is the complete loss of consciousness, but preceding this there may be a short period of convulsive twitchings or weakness of the face or limbs. When consciousness is lost, the patient falls to the ground, the breathing becomes laboured and stertorous, with a flapping in and out of the cheeks, caused by their paralysis, and by that of the soft palate. Commonly, the face, arm and leg on one side of the body, will now be found to be either convulsed or paralysed. As the fit continues, the paralytic symptoms become more developed, and with this there is steadily deepening coma. Reflex is nearly or quite abolished, and the pupils may be widely dilated, or unequal, or small, but are generally fixed, and in any case, do not react to light.

The pulse, as a rule, is full and slow. The larger venous trunks are often distended. (In uræmic fits, pallor, and a small pulse are frequently present.) In such a case the coma may get steadily deeper and end in death, without any effort at a rally, in a few hours or days. If this does not happen, after a period so *variable that* no estimate is possible, there is a gradual *lightening of the coma*, twitchings cease, and reflex *gradually returns*. Later, the patient can be partially

roused, and then returns to a state of consciousness. This, however, is rarely at first unclouded, and with it there generally comes the appreciation of permanent paralysis of the limbs or face, and often, aphasia in some one of its forms. The after history of the case is generally one of improvement.

Bearing in mind the usual cause of this condition of apoplexy, it will be plain that all direct attempts at rousing or restoration of consciousness will not only be futile, but will be actively harmful. The first and great point in the treatment will be to get the circulation as quiet, and the heart's action as free from embarrassment as is possible. A "do nothing" policy is therefore on many points essential; but, except in the more transient and slighter attacks, or on the other hand, in those cases of *apoplexie foudroyante*, in which death occurs almost immediately, there are certain indications for relief of the cerebral circulation which should, if possible, be fulfilled.

There will be little difficulty in recognising whether the case be one in which nothing is required except absolute rest and quiet watching, or whether more active treatment is called for. In the latter case, the chief measures are the local application of cold to the head, and free purgation. If the head be hot, or the face flushed, it can never be unwise to cut the hair short, and apply an ice bag, or cold water.

Such measures as bleeding, leeching, wet or dry cupping, or a free drastic purging may, any of them, be ordered by the responsible medical officers, but in the majority of cases of apoplexy, the one thing needful in the first place, is to keep the patient still in bed, with the head slightly raised, in a dark room, taking particular care that there be no obstruction to the respiration.

The practical management of an *Epileptic Fit* may be very shortly described. In the epileptic, as in the apoplectic state, the prominent feature is the absolute loss of consciousness. The attacks also vary infinitely *in their severity* and duration, from those cases of

petit mal—in which there is a momentary confusion and loss of consciousness, gone almost before it is felt—to the most violent storms of convulsions, lasting, it may be a full half-hour. The following may be taken as an account of a moderately severe epileptic fit.

Quite suddenly, or after some subjective premonitions, as of a creeping sensation, or travelling wave of coldness or the like, which is known by the name of an "Aura," the patient becomes unconscious and falls to the ground, often with a cry or groan. Almost all the body is then thrown into a state of tonic convulsion, the back is rigid and slightly arched, the legs extended, and the head thrown back or to one side; the respiratory movements are arrested with the others, and the patient becomes more or less asphyxiated. The asphyxia, however, seldom becomes extreme, and after a time, shorter than it appears to the lookers on, the tonic contraction passes into a state of general clonic convulsion, in which there is a rapid succession of to-and-fro movements; the limbs are alternately flexed and extended, the eyelids and jaws opened and shut; the head and eyes are turned to one side; there is frothing at the mouth. At this stage, too, the tongue may be bitten, or the nails driven into the palms. Gradually, and generally after a very few minutes, the convulsive movements quiet down, and a condition resembling coma, but which only in the most severe cases is true coma, follows. Soon this comatose state passes into one more like natural sleep; the asphyxial colour disappears, and as a rule, the patient wakes up within half-an-hour or an hour, ignorant of what has happened, unless previous experience has taught him to understand the position of affairs.

In such an attack, nothing ought to be done with the idea of any restoration to consciousness, and all that is called for is to see that, during the convulsions, the patient does himself no injury, either by tossing *his limbs* or head about, or by getting into such a *position that respiration* is interfered with. Anything *tight about the* neck, chest, or abdomen, should be

loosened, and especial care should be taken that the tongue does not get caught between the teeth. If this happens, the jaws must be forced open, and a piece of cork, or wood, or some other suitable wedge inserted to keep them apart.

Strenuous efforts at restraint of the convulsions appear rather to excite them, and are never necessary. As soon as the violence of the fit is over, the quieter the patient is left the better, and, if natural sleep follows, it should be encouraged to last as long as possible. On waking up, if any signs of exhaustion are present, a little soup or beef tea is useful, but no alcohol.

Epileptic malingering. In hospital practice the house surgeon or dresser must be on his guard against being deceived by malingerers, who feign to be epileptics in order to obtain admission. The only way to detect them with certainty is to be thoroughly acquainted with the symptoms of the genuine attack.

Foaming at the mouth may be simulated by soap, and much "lather" about the lips is in itself suspicious; but the crucial point is the insensibility. In genuine cases this is absolute. Many malingerers are aware of this, and will bear pain inflicted as a test, with a fortitude worthy of a better cause, but faradisation judiciously applied can hardly be resisted for more than a few moments.

The Convulsions of Infants. The equal balance of the cerebral government is, in infants, very easily upset, and convulsive attacks may occur from very slight causes. Worms, teething, intestinal irritation, or some cutaneous irritation, such as that caused by a pin, may, any of them, be sufficient to bring on an attack. It is especially in children suffering from rickets that peripheral irritation from any cause is liable to induce convulsions. On the other hand, the fit may be an indication of the gravest brain disease, or may stand in the place of the initial rigor which in adults heralds the onset of some acute fever.

Taking as an example the convulsions caused by the irritation of the gums during teething, we shall find

that the child, after being hot and fretful for some hours previously, is noticed suddenly to "look queer," or to squint. A general spasm of rigidity then passes over the body, the face becomes pale and set, the eyeballs are turned inwards, and respiration is almost arrested, in consequence of which an asphyxial look quickly develops. This rigidity, however, generally lasts only for a few seconds, and is succeeded by twitchings of the face, and other clonic convulsions. These again quickly subside, and the child falls into a sleepy, semi-comatose condition, which soon becomes a natural sleep. Consciousness is quite abolished during the fit itself.

This is an account of a rather severe fit, and they are found of all degrees. Often the whole attack is compressed into a momentary loss of consciousness, with a spasm of rigidity, followed by a little drowsy heaviness. But in all, except the very slightest, the condition is certainly one which must be hurtful to brain action; the cerebral circulation, therefore, should be relieved if possible, and that quickly; such relief can be given most directly and readily, by putting the child into a hot bath *at once*, at as high a temperature as can be borne (say 103° Fah.). If this can be got directly, the child may with advantage be put in, clothes and all, and undressed in the water. It should be immersed up to the neck, and a sponge of cold water may be placed at the back of the head.

Indirectly, too, the bath fulfils several good purposes. The undressing of the child will enable a thorough examination to be made, and will discover if, by any carelessness, there be a pin running into the skin, or any other local irritation. Possibly the warmth may hasten the appearance of the rash of some fever, or if there be intestinal colic, this will be relieved. A grain or two of calomel should be placed on the tongue, especially if there is any likelihood of *intestinal irritation*. Bromide of potassium should be *given by mouth* (5 grains) or by rectum (7–10 grains). *Chloral* (*3–5 grains*) may be usefully combined with it.

CHAPTER X.

Of Restoration From Drowning, Etc.

In all forms of asphyxia it is important to recollect, first, that insensibility comes on very soon, some time before the convulsive struggles cease, and is succeeded by a paralysis of all the voluntary muscles, including those of respiration; and secondly, that the heart's action may continue for a long time after the ordinary muscular movements are abolished.

It will probably save needless repetition if we here consider the steps to be taken with the object of restoring suspended animation in ordinary cases of drowning; and taking this account as a typical case of suffocation, to leave it to the reader's common sense to fill in the details of the slight variations which are called for by the different circumstances of other forms.

In *Drowning*, several causes are generally present to produce a condition of lifelessness, in addition to the asphyxia itself. Thus, *shock* is often present and may be a very important factor. *Exhaustion* from long continued struggling, and the effects of *exposure to cold*, are also common, and have to be dealt with.

Still, the great agent in producing the condition, is suffocation, and this must first of all be combatted.

Supposing, then, that the body of an apparently drowned person has been recovered from the water, and that respiration is found to have stopped, it may well be that the breathing can be set going again by simply making sudden forcible pressure at the pit of the stomach some three or four times, at intervals of three or four seconds; but should this not be quickly followed by respiratory movements, artificial respiration proper should be at once begun.*

* It is generally best to do this on the spot, but if a shed or house be close at hand, the loss of a few moments may sometimes be risked, in view of other advantages.

For this method to be of the least avail, all its details must be carried out regularly and thoroughly; the object being so far to imitate the natural thoracic and abdominal movements, that air may be sucked into, and squeezed out of, the chest.

The three principal ways of doing this are known as "Sylvester's," "Marshall Hall's," and "Howard's."

In Sylvester's method (Figs. 87, 88), the arms are used as levers, acting so as to expand the chest walls by means of the muscles placed between the limbs and the trunk, the origins of the muscles acting now as insertions, and *vice versa*.

The patient should be first laid on his back, and some convenient support be placed under the shoulders, so that the chest may be thrown out, and the neck extended, with the head thrown back (Fig. 87). If this be properly managed, there will not generally be any necessity for the tongue to be drawn out of the mouth, for the larynx will be kept open by the chin being kept well up. But it may sometimes be desirable for an assistant to draw forward the tongue, and if so, the best way to hold it, in the absence of proper forceps, is with the corner of a handkerchief between the finger and thumb. This is much better than trying to fasten the organ down to the chin with an indiarubber band, or running a hair-pin through it, as has been recommended.

Everything which in the least confines the neck, chest, or abdomen, must be loosened, and the mouth and nostrils cleansed from any mud, etc. Should there be any water lying in the pharynx the patient may be turned over on one side to let it run out of the mouth, but no direct attempt should be made to empty the stomach.

These preparations should only occupy a few moments. The surgeon, then kneeling at the patient's *head*, must take hold of the arms above the wrists *and carry them* well over the head, right back as far *as they will go* (Fig. 87). The chest walls will then *be expanded*, and generally air can be heard passing

through the glottis. The arms must then be brought down against the sides, and the forearms crossed over the pit of the stomach. Leaning now with his weight upon them (Fig. 88), the operator makes forcible pressure upon the abdomen, so as to press up the

FIG. 87.—*Sylvester's Method.—Inspiration.*

diaphragm, and this should elicit a distinct grunt from the patient; if it does not it is doubtful if air has entered the chest cavity at all; the whole process is then repeated.

The rate at which artificial respiration should be made varies with the age of the patient, and should be about the rate of normal breathing for that age, say, for an adult, seventeen times a minute.

If recovery be going to take place, generally a very few minutes will be sufficient to restore natural breathing movements, and then care must be taken not to interfere with the short gasps with which natural respiration begins; but the patient must still be care-

fully watched, for the condition, like that of shock, is one very prone to relapse, and the respiration may fail again after it has been restored.

FIG. 88.—*Sylvester's Method.—Expiration.*

While this principal restorative process is being carried out, other secondary aids to recovery should be attended to. These do not differ greatly from those already described for shock.

A warm bath should be prepared, and the dripping clothes exchanged for dry, warm blankets. Frictional warmth is a very useful agent, and the extremities and flanks may be energetically rubbed in the direction of the venous circulation.

As soon as respiration has been fairly established, *the hot bath*, if procurable, may be used. The temperature must be high, say 104° Fah., and the time of immersion short. The patient may then be put to bed

between blankets, with hot water bottles, and some stimulant, such as hot brandy and water, may be given, especially if there be still feebleness of the heart's action, or shivering.

Marshall Hall's method is generally said to be easier for one person to perform unaided, if the patient be heavy, or the operator weak. Whether this be so or not, it is, we believe, certainly less efficient. For its performance, the body is rolled half over from the position of lying on the back, to that of lying on the side, when the arm which is uppermost, is pulled forwards out of the way, and pressure is made on the side of the chest to expel as much air as possible (the expiratory movement). The body is then rolled over on to the back (the inspiratory movement) and these manœuvres are repeated at the same rate as in Sylvester's method.

The following are the rules of procedure for *Howard's* method:—

1. *Instantly* turn patient downwards, with a large firm roll of clothing under stomach and chest. Place one of his arms under his forehead, so as to keep his mouth off the ground. Press with all your weight two or three times, for four or five seconds each time, upon patient's back, so that the water is pressed out of lungs and stomach, and drains freely out of the mouth. Then:—

2. *Quickly* turn patient, face upwards, with roll of clothing under back, just below shoulder blades, and make the head hang back as low as possible. Place patient's hands above his head. Kneel with patient's hips between your knees, and fix your elbows firmly against your hips. Now—grasping lower part of patient's naked chest—squeeze his two sides together, pressing *gradually* forward with all your weight, for about three seconds, until your mouth is nearly over mouth of patient; then, with a push, *suddenly* jerk yourself back. Rest about three seconds—then begin again, repeating these bellows-blowing movements *with perfect* regularity, so that foul air may be pressed

out, and pure air be drawn into lungs, about eight or ten times a minute, for, at least, one hour, or until patient breathes naturally.

Note.—The above directions must be used on the spot, the first instant the patient is taken from the water. A moment's delay—and success may be hopeless. Prevent crowding around patient; plenty of fresh air is important. Be careful not to interrupt the first short natural breaths. If they be long apart, carefully continue between them the bellows-blowing movements as before. After breathing is regular, let patient be rubbed dry, wrapt in warm blanket, take hot spirits and water in small occasional doses, and then be left to rest and sleep.

Dr. Howard claims a superiority for his method for the following reasons:—

1. The direct method alone provides for a thorough preliminary ejectment of fluids from the stomach and thorax.

2. This method alone makes the drainage of the pharynx constant, precluding failure from lodgments there, or suction thence into the trachea.

3. In this method the usually impracticable task of opening the mouth and pulling forward the tongue is more than superseded by simple position.

4. This same position also secures, and that in the only way possible, the instant elevation of the epiglottis.

5. The compression by this method is the most complete, and capable of the most delicate adaptations.

6. It is the only method which can be practised by one person, and which by the same person can easily be continued as long as it may be of use.

In *suffocation by the fumes of charcoal or coke*, by the *carbonic acid in brewery vats*, or by the *choke damp* of mining accidents, or in cases of *hanging* other than those performed by the public executioner, we have examples of suffocation, in all of which the great *agent for resuscitation*, must be artificial respiration. *As a rule the conditions* are more simple than in *drowning. as shock.* or exhaustion, or cold, the effect

of which in drowning have to be overcome, is not generally present, but the main principles of treatment remain the same.

In asphyxia, as in other forms of suspended animation, the muscular fibres of the heart and of the muscles of respiration may be stimulated to contract by an electrical current; the following directions for its application are given by Beard and Rockwell:—

"The faradic current is usually employed, but the interrupted galvanic current might answer the purpose.

"Graduate the current to a strength sufficient to produce vigorous contractions of the muscles of the ball of the thumb. Then press the electrodes firmly over the phrenic nerves, between the sterno-mastoid and scalene muscles; or, put one electrode over one phrenic nerve and the other in the seventh intercostal space.

"Interrupt the current about three times a minute, while the assistant presses firmly on the abdomen, pausing occasionally to observe the effect.

"If no inspiratory movements appear after a number of interruptions, increase the strength of the current.

"The electrodes must be large, and well moistened."

CHAPTER XI.

Of the Treatment of Cases of Poisoning.

We have now to consider the measures which should be taken when some one of the substances which are commonly used as poisons, or which may be so used, has been taken into the body in sufficient quantity to produce toxic symptoms. The following are the chief of these substances, and we will consider them in the order in which they are here given.

General Poisons.	*Irritant & Corrosive Poisons.*
1. Alcohol	1. Carbolic, Oxalic, Sulphuric and other — Acids
1a. Ether	
2. Kerosine oil	
3. Opium	
4. Strychnia	2. Corrosive sublimate
5. Belladonna	3. Arsenic
6. Prussic Acid	4. Antimony
6a. Nitro-Benzol	5. Phosphorus
7. Chloral	6. Caustic alkalies

Poisonous Foods.

Shell fish. — Mushrooms.

The general poisons vary too greatly among themselves to admit of any general description, and must be considered separately.

Acute alcoholism. As the result of taking excessive quantities of alcohol, various degrees of poisoning are brought about, from the slighter effects which are sufficiently familiar, to the more severe condition in which the patient becomes absolutely unconscious, and in which actual danger to life may exist. For convenience the slighter degrees of poisoning may be spoken of as *drunkenness*, whilst the stage of insensibility may be called *acute alcoholic coma*. The former is not in itself dangerous, and usually the best course

to take with drunken men or women is to leave them to sleep off the effects of the alcohol. Nevertheless, even a moderate grade of drunkenness may be dangerous in old or feeble people, with degenerated tissues and weak circulation, for it may be the cause of a grave cerebral disturbance (generally of the nature of an apoplexy), or of a failure of the heart's action. The latter event must be particularly guarded against in cold weather, for, in consequence of the dilated condition of the arterioles of the skin, drunken people lose heat very quickly. Care must be taken therefore, in thus leaving drunkards alone, that their conditions are such that there is no chance of their getting dangerously cold.

It often happens in the casualty department, that it is desirable to make a patient sober as soon as possible. For this purpose nothing is more effectual than a brisk emetic. Sulphate of zinc, sulphate of copper, or tartar emetic may be used in sufficient doses.* If the patient be violent or refuse the draught, it may be given with the stomach pump (the use of which is described later), but in practice it will be found that if the pump has to be used at all, a sufficiently sobering effect will be produced by washing the stomach out with two or three pints of warm water. In certain cases, a hypodermic injection of one-tenth to one-eighth of a grain of apomorphia may be administered. Although this emetic is generally reserved for graver cases of poisoning (*vide infra*), still it appears to be safe.

For the common occurrence of a drunken and disorderly person being brought to the hospital, and refusing to give his or her name and address, faradism, strong enough to produce painful contraction of the muscles, will generally prove effectual when the proceeding is really worth while.

---

* An effectual but a very nauseous draught was, and probably still is, used at St. Bartholomew's, under the name of "half-and-half." It consisted of 30 grains of sulphate of zinc in ℥iss of water, added to an equal quantity of house physic. (Hab. *Sennæ Co.* P.B.).

A short experience will enable anyone to separate ordinary cases of drunkenness from other forms of poisoning, and we need not particularise its symptoms. There may be considerable difficulty in diagnosing between the higher grades of acute alcoholism and other grave conditions, such as apoplexy, concussion of the brain and opium poisoning. Whatever the difficulties, we shall avoid falling into very serious error by remembering that even if the condition is brought about by alcohol, it is now not an alternative question, drunk? or dying? but a positive statement, drunk *and* dying. Any patient who has swallowed enough alcohol to produce symptoms which may be confounded with apoplexy or any other severe illness, must be considered to be poisoned, and to be in need of careful treatment.

In these cases of acute alcoholic poisoning, the condition of the circulation and respiration will be the best guide as to whether the patient may be left to recover from his stupor without further measures beyond those which are required for keeping him warm, or whether the stomach pump should be used; but in most cases it will be best to wash the stomach out with warm water, and this should always be done if there be any sign of failure of the heart's action, or if the breathing be suspiciously shallow. Alcohol may remain for a long time nearly unchanged in the stomach, and should therefore be removed, to prevent further absorption. In extreme cases, artificial respiration may be called for, but these are generally speedily fatal.

If the stomach pump be not at hand, emetics may be used, but as it is undesirable to further irritate the already injured stomach, preference should always be given to the pump if possible. This irritable condition of the stomach should always be kept in mind in the treatment of the case after the acute stage has passed.

Intoxication by drinking *ether* is hardly known in *England, but is* stated by Dr. Richardson to be *common in* some parts of Ireland. As a result of

inhalation, it is of daily occurrence in all hospitals. When it is swallowed, its effects nearly resemble those of alcohol, but the period of excitement is more marked, and that of stupor less so. It is much more rapidly eliminated, so that the whole intoxication is shorter, and less poisonous, although Dr. Morshead, of Draperstown (the head-quarters of ether drinkers), has recorded four fatal cases. Its treatment does not differ from that for alcoholic poisoning.

Almost the same may be said of a form of poisoning, now getting more common, namely by *kerosine*, or some mineral oil. When this is swallowed it produces flushing and excitement, followed by drowsiness. In these cases the major part of the oil is generally vomited spontaneously, but the stomach pump should in all cases be used, or failing that, an emetic should be given.

Poisoning by *opium, or by its alkaloids* is very common, and is getting more so, not from any increase of suicide by this means, but from the numerous instances of inadvertence occurring in the growing class of people who have acquired the habit of administering the drug to themselves.

When opium is taken for suicidal purposes, laudanum is generally employed, and it often happens that the suicide swallows a very large quantity. This very frequently leads to failure of the attempt, through the active vomiting which is set up.

The symptoms of opium poisoning are generally distinct enough. The slow, shallow respiration, and feeble, fluttering pulse; the pallid, almost livid skin, covered with a cold sweat; the obstinate drowsiness or profound stupor; and, above all, the fixed, contracted pupils, are sufficient evidence of the condition, even without any external or circumstantial proofs.

In this condition the respiratory centre is the part in greatest danger of striking work, and it must be kept going until the poison has been eliminated. By every possible means the patient must be roused, and *kept awake*. Generally the best way is to keep him

exhaustion, and will very often take place in less than an hour. If the dose has not been a fatal one, the spasms will gradually diminish in frequency and force. In the treatment, the main reliance must be placed upon inhalations of chloroform, and large and frequently repeated doses of chloral hydrate and bromide of potassium. Nitrite of amyl may be inhaled (and "artificial respiration, if possible," performed, Murrell). If by any means the first few hours can be tided over, hopes of recovery may be fairly entertained. If the form in which the poison has been taken be rather a bulky one, as a vermin poison, then in the first instance the stomach pump must be used, or a brisk emetic, *e.g.*, one of sulphate of zinc, or of mustard and water, must be very promptly given; if lock-jaw exists $\frac{1}{8}$th of a grain of apomorphia may be injected subcutaneously.

Belladonna poisoning. This is generally accidental, as from eating the berries of the "Deadly Nightshade" (Atropa belladonna), swallowing lotions containing atropine, or through some similar mistake. The symptoms are very characteristic. The pupils are widely dilated, and the skin capillaries injected, occasionally producing a rash like that of scarlatina. There is much cerebral excitement, the delirium is generally chattering and restless, but may be extremely violent. The mouth is always parched, and the skin very dry.

Emesis must be produced by the stomach pump, or by sulphate of zinc, etc., or by apomorphine $\frac{1}{10}$ gr. and following this, stimulants should be given in the shape of alcohol or ether, as well as strong tea or coffee, which are also useful from the tannin they contain. Artificial respiration may be necessary in very severe cases, and in others, external stimuli such as douche, faradisation, etc.

Both morphia and chloral have an antagonistic *action to atropia*, but this is in neither case so distinct *as that of pilocarpine*, $\frac{1}{4}$ to $\frac{1}{2}$ gr. of which should be *injected subcutaneously*, and repeated if sweating be

a dose, to be repeated, or slightly increased, if the symptoms seem to be improving under it

When improvement has once commenced, it is generally continuous. The pupils may remain contracted for a long time, but when the respiration and circulation appear to be well established, and the patient is able to keep himself awake, the best treatment will be warmth in bed, when natural sleep will probably soon come on and may be encouraged. The patient should be watched, however, lest the respiration should again begin to fail and other symptoms of poisoning re-develop. Alcoholic stimulants seem to be hurtful in all stages of the poisoning.

Strychnia poisoning. This alkaloid is a common ingredient of "vermin powders," "beetle paste," and the like, so that strychnia poisoning by misadventure is rather frequent. The symptoms of this condition can only be mistaken for those of acute tetanus, and this error can hardly be made if attention be carefully given to the case for a short time. The condition is, of course, a "tetanus" in both cases; but in that of the poisoning, the rapid development and acuteness of the attack, the universality of the convulsions, as opposed to the almost invariable spreading from the neck and jaw muscles in the ordinary tetanus, the nearly complete relaxation in the intermittent periods, and the fact that the duration of the whole attack is to be measured by hours—all these will enable a diagnosis to be made with almost absolute certainty, although indeed this is of the less importance in that the treatment may be much the same in either case.

In strychnia poisoning there is a very short period of abnormal restlessness, quickly followed by a general trembling, and then complete opisthotonos, with marked "risus sardonicus," and cyanosis. In half a minute, or a minute, the spasm relaxes, and there is a period of exhaustion and respite, to be succeeded on the slightest irritation, or apparently without any cause, by a similar storm of reflex contraction. If *death occurs*, it will generally be from asphyxia, or

action is *nitro-benzol*, or artificial oil of bitter almonds, nor would the treatment of poisoning by the latter differ in any respect.

Chloral poisoning. As in the case of opium poisoning, this is generally a poisoning by misadventure, due to the increasing habit of self-administration of drugs by the laity. The symptoms resemble in great measure those of opium poisoning, but the fixed contraction of the pupils is absent, and the circulation is affected quite as much as is the respiration.

In all respects of rousing, emetics, etc., the treatment is the same as for opium, and so also with regard to affusion, faradisation and artificial respiration. It is even more important than in opium poisoning that warmth should be kept up, and the administration of a pint of hot strong coffee by the rectum will fulfil the indications of warmth and stimulation.

With regard to an antagonist, the most distinct one is strychnia; 4 ♏ of the liq. strychniæ may be injected beneath the skin, and repeated if necessary.

The irritant and corrosive poisons may conveniently be grouped together, for the symptoms of the latter only differ from the former in their greater intensity. Moreover, many of the substances in our list, in weaker solutions, are irritant poisons, and corrosive poisons when concentrated. In most cases the local effects are so marked that any constitutional results of their absorption are unnoticed.

The following is the general sequence of events after an irritant poison has been swallowed. There is first a burning metallic taste in the mouth and throat, and then a sense of intolerable pain referred to the chest, behind the sternum (heart-burn). This is followed by increasing general abdominal pain, so that the legs are drawn up, as in peritonitis, and the belly becomes tumid. Vomiting is almost invariably present, and *there is* generally great thirst.

If the poison has been taken in a quantity insufficient to cause speedy death, and if it be irritant only, and not corrosive, the above are the chief symptoms.

In the less severe cases these may, with appropriate treatment, be subdued; on the other hand, if the dose be a fatal one, the symptoms of irritation will quickly be followed by dyspnœa and increasing collapse, so that the patient looks to be in the algid stage of cholera, and this will continue until death by syncope occurs.

But if the substance be truly *corrosive* in its action, such as one of the concentrated mineral acids, the symptoms are even more severe, and run a much more acute course; it is probable that no recovery has ever taken place after such a poison has been swallowed, so that any quantity has passed into the stomach, although instances are common of great damage to the throat and œsophagus being followed by recovery; or, we should rather say, by recovery in the first instance, for generally the consequent cicatrisation has lead to contraction and stricture.

The damage to the lips and throat is the first and most prominent symptom, and gives the measure of the extent of the corrosion of the parts lower down. The corners of the mouth will be marked, and the tongue and palate covered with a whitish coat of slough, "like a coat of paint," if sulphuric, or hydrochloric acid, or corrosive sublimate has been used; or with a yellow stain, in the case of nitric acid.

In the presence of these signs of corrosion a very few minutes will decide whether the poison has been really swallowed. If so, the symptoms which have just been detailed will develop, but more rapidly and more acutely. The stage of collapse is reached more quickly, and there are signs of actual destruction of the viscera. The vomit contains shreds of sloughing mucous membrane, or it may be, casts of whole sections of the œsophagus. The abdomen becomes enormously distended with gas. The dyspnœa and dysphagia are both intense, and death usually occurs within a few hours.

In many respects the treatment of poisoning by *irritant or* corrosive substances is common to them *all; and again*, with regard to many, there are some

particular antidotal drugs, or some special meas
to be taken or avoided.

In the first place, the stomach pump should be u
unless there be evidence of such corrosion as to m
it probable that the walls of the œsophagus or stom
are too much damaged for the tube to be safely pas
Such a case is indeed practically hopeless from
first, unless the damage be confined to the upper
of the canal.

The vomiting, which is almost always pres
should be encouraged by giving warm water,
failing the stomach pump, the natural emesis ma
encouraged by mustard and water, or by the injec
of apomorphia.

As soon as the stomach has been relieved of
poison, raw egg albumen, milk, barley water, ar
root, or whatever mucilaginous fluid can be
readily procured, should be given. Egg albumen,
is probably the best in all cases, as well as havi
special action on corrosive sublimate. Salad oil
generally be given with good results, except in
case of phosphorus poisoning. The rest of the gen
treatment of irritant poisoning will be directed tow
the symptoms of peritonitis and collapse. The
must be subdued with full doses of opiates.
warmth of the body must be maintained, and the o
signs of shock combatted by such stimulation
afforded by the inhalation of ammonia, or nitrit
amyl, the subcutaneous injection of ether and bra
stimulant enemata, faradisation of the extremi
etc. Morphia by hypodermic injection will
generally be indicated.

Special points in the treatment of particular irri
and corrosive poisons.

I. *For irritant and corrosive Acids.*

These comprise sulphuric, nitric, hydrochl
oxalic, and carbolic acids; the symptoms in the
of the first three will be similar, and in accord
with those results of swallowing any corrosive
which have just been described. The acutene

the symptoms will vary directly with the strength of the solution, and inversely with the quantity of food in the stomach. In all, if a strong solution be actually swallowed, the symptoms will be of the most urgent kind, and will be rapidly fatal if not at once counteracted, so that time is of the utmost importance. The stomach pump may not safely be used unless the acid has been in quite a dilute solution. The charring in the case of nitric acid is yellow, and the vomit possesses a nitrous smell. In sulphuric and hydrochloric acids, the lips and mouth are whitish, and the vomit dark or black, containing charred shreds of mucous membrane.

The treatment lies in diluting and neutralising the acid as quickly as possible, so that all remedies should themselves be copiously diluted. Lime water (the saccharated is the best), whiting and water, chalk and water, soap and water, ordinary washing soda, or the bi-carbonates of soda or potash, or any of the preparations of magnesia, in solution, are all useful alkaline remedies. Some of them will almost certainly be at hand in any given case, and it should always be borne in mind that "the nearest remedy is the best."

In addition to alkalies, milk, olive oil, and the other demulcents mentioned above are all useful.

In poisoning by *Oxalic acid* or by *Salts of sorrel* (the acid oxalate of potash) the main special point to bear in mind is that the alkaline oxalates are soluble and poisonous, so that chalk, whiting, lime water, or magnesia must be used to neutralise the acid, and not soda, potash, or ammonia, or the carbonates of any of these. Oxalic acid poisoning is rather common and is frequently suicidal. The symptoms are those already detailed, save that collapse is often disproportionately marked, and that death may be very speedy.

Carbolic acid poisoning is now perhaps the commonest of all forms of poisoning by misadventure and is also used for the purposes of suicide. Its corrosive action is, in concentrated solutions, very conspicuous, but the destruction does not extend deeply into the

tissues. The mouth and jaws are usually covered with a white, leathery pellicle. The symptoms are those of poisoning by any corrosive fluid, but pain is even more intense than in the case of the other acids, while on the other hand the collapse, and other symptoms of the gravest local injury are not so manifest, nor is the whole course of events after the poison has been taken, so hurried.

Treatment. The sulphates of magnesia or soda, in half ounce doses in a tumblerful of warm water, should be given at once, and the stomach washed out with warm water, or with the same alkaline solution three or four times, half-a-pint or so of the solution being afterwards left in the stomach. In the absence of the stomach pump, vomiting must be produced by zinc sulphate, mustard and water, ipecacuanha, or the injection of apomorphia. Later on demulcents, such as barley water, olive oil, etc., may be given, or an ounce of castor oil.

Shock is often very marked, and must be treated by frictional warmth, ammonia, etc., as before stated. If there be much restlessness *chloral* should be given, as there is an antagonism between it and carbolic acid.

The urine is often dark and scanty, and may be suppressed, in acute carbolic acid poisoning. The carboluria is then a grave symptom, but it often happens in surgical cases, that carbolic acid, not necessarily used in very large quantities, is absorbed and produces a similar inky urine.

II. For *corrosive sublimate* (perchloride of mercury) the acid nitrate of mercury, etc., albumen in any shape (even gluten of flour is better than none, but white of egg is best) should be freely given, as an insoluble albuminate is thus formed. Emesis should be encouraged by warm water or mustard and water, if vomiting be not active without such aid. If the solution has been concentrated the stomach pump *must only be used* with great care.

III. Arsenical poisoning is generally effected by *arsenious acid* (white arsenic), and is frequently given

with criminal intent. The symptoms do not come on immediately after taking the poison. The vomiting and purging resemble at first an intensely violent bilious attack; afterwards the symptoms are more like acute cholera, and the diagnosis is often obscure. The emesis must be encouraged, and the stomach emptied by the pump. This should be followed up with oil, switched eggs, or a mixture of oil and saccharated lime water. Magnesia is also very useful, but the substance which best neutralises the action of arsenic or arsenious acid in solution, is the freshly prepared hydrated peroxide of iron. This can be quickly made by adding half-an-ounce of common carbonate of soda to a fluid ounce of tinct. or liq. ferri perchlor., and filtering. As a substitute, dialysed iron in ounce doses may be given.

If the diagnosis of the acute form of this poisoning is not generally easy, that of chronic arsenical poisoning is always difficult, but this condition does not fall under the heading of emergencies.

IV. *Poisoning with antimony*, in the form of tartar emetic.

The symptoms come on quickly, and generally the vomiting is so violent that the whole of the poison is soon ejected. If not, the symptoms resemble those of arsenical poisoning, but there is more depression. The treatment is the same as in arsenical poisoning; but in addition, *tannin* should be given in the form of very strong tea or coffee, or by means of preparations of oak or cinchona bark, or of tannic acid itself.

V. *Poisoning with phosphorus.* This is usually taken in the form of beetle paste, or rat paste, or sometimes by swallowing the heads of lucifer matches. In these cases the symptoms declare themselves soon after the poison has been taken, and are generally prolonged over days or it may be weeks. The prominent symptoms are great thirst, with heartburn, and violent vomiting, the vomit being phosphorescent in the dark, and the breath smelling strongly of the poison. The result will mainly depend on whether the

vomiting be sufficiently active to prevent an absorption of a really poisonous amount. If the quantity absorbed be large, the symptoms remain acute; hæmatemesis and bloody purging are often present, with cramps, and finally coma. But if only a small, but still poisonous quantity has been taken (say ½ to 1 gr.). after the first indications of irritation have passed over the symptoms usually subside for a day or two, and then the signs of acute atrophy of the liver begin to declare themselves. Then the jaundice deepens and a comatose, typhoid condition, with delirium, generally ends in death in a few days, although in some of the milder cases recovery may take place. The early treatment of the poisoning does not differ from that of other irritants, saving that oil, in which phosphorus is soluble, should never be employed with the idea of soothing the intestinal mucous membrane. After the stomach has been emptied of its contents, either naturally or with the stomach pump, mucilage, magnesia in barley water, or similar demulcent fluids may be given. The only drug which seems to have any action in preventing the liver changes is the French oil of turpentine in full repeated doses of 15 ♏ to ʒss.

Chronic phosphorus poisoning, phosphorous necrosis, etc., cannot here be discussed, as they do not occur as emergencies.

VI. *Poisoning by caustic alkalies and their carbonates.* This form of poisoning is rare, but potash or soda lye is sometimes taken. The symptoms are those of ordinary irritant poisoning, except that violent purging is generally a prominent symptom. In the treatment, the question of the use of the stomach pump must be decided by the amount of caustic destruction. Weak acids, such as vinegar and water, or any of the dilute pharmacopœial acids, should always be given.

Poisonous Foods. A form of acute gastro-intestinal *irritation*, often so severe as to justify the term poisoning, *is not infrequent* as a result of eating shell fish, *especially mussels.*

In the treatment, an emetic should be given in the

first place, and afterwards a full dose of castor oil with 20 to 30 ♏ of laudanum, chlorodyne, or of some similar sedative. This is to be repeated if necessary. Atropia is here also indicated, although not so distinctly as in the case of poisoning by muscarin. The manner of administering, and the dose, are the same as in the following case.

Mushroom poisoning should not go without mention, although in London cases are rare. Most fungi, edible or inedible, may produce, if improperly cooked, symptoms of a mild degree of irritant poisoning, similar to those which have been mentioned, and which may be treated in a similar way. But cases of true *muscarin* poisoning exhibit a much higher grade of toxic symptoms. The fungi which contain muscarin or some similar alkaloid are not very numerous in England, the principal one being the fly fungus (Amanita muscaria). When the more actively poisonous fungi have been eaten, as a rule great cerebral excitement is caused, in addition to the more strictly irritative effects on the alimentary tract.

In the antagonism between *muscarin* and *atropia* we have perhaps the best example of this mode of the physiological action of drugs. Digitalis also, though in a less degree, is antagonistic to muscarin. Whenever, therefore, the symptoms of mushroom poisoning are grave, and especially if there be delirium or mania, atropia should be given, say iij to v ♏ of the liq. atropiæ, by the mouth, or ii ♏ subcutaneously, or as an alternative treatment, full doses of the tincture or infusion of digitalis may be administered. In other respects the treatment should consist in removing the poison from the alimentary tract as soon as possible, by means of emetics, etc., and in allaying the irritation by demulcents.*

* In this chapter the directions as regards the administration of *antagonists* have been retained for the sake of completeness, but no unqualified person would be justified in administering an antagonistic dose of a powerful drug on his own responsibility. For further information as to the treatment of cases of poisoning the reader is referred to Dr. Murrell's excellent little pocket-book ("What to do in cases of poisoning," H. K. Lewis).

Of the washing out of the Stomach, and of the use of the Stomach pump.

The use of the stomach pump in cases of poisoning has been already several times alluded to, but it is employed on many other occasions as well, as for the feeding of refractory patients, or in the treatment of some forms of dyspepsia.

There are several forms of the pump, but a very common and convenient one is that here figured (Fig. 89). It is made on what is known as the "flute key"

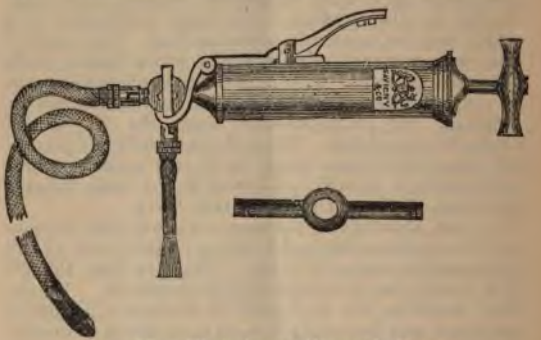


FIG. 89.—*Flute-keyed Stomach Pump.*

principle, and its action can be readily understood from the illustration. The tap of the pump is a two-wayed one, and if the piston were to be drawn out while the lever at the top in the figure remained in the position in which it is drawn, fluid would be sucked into the cylinder from the vertical tube, and similarly expelled by that tube, if the piston were afterwards pushed in. But if the lever be depressed, the vertical *tube would be shut off*, and the horizontal one will now *be in communication* with the cylinder and piston; so *that, by depressing* and raising the lever synchronously

with the to and fro movement of the piston, fluids may be sucked from the vertical tube, and expelled by the horizontal one, or *vice versa*, according to the relative position of the lever and piston.

The important point in the use of the stomach pump is the insertion of the tube. In restless or refractory patients it will be necessary to use a gag, and although almost any form will do, the best is a piece of hard wood, of such a size that it will lie across the mouth between the front molar teeth, and it should be broad enough to allow of a hole being bored through its centre, through which the tube can be passed. (*Vide* Fig. 89.)

In other cases no gag is required, and then the tube, which is made of gum elastic, having been well warmed and softened, can be passed with the right hand and guided by the left forefinger through the pharynx and down the gullet, with much greater ease. As soon as the end of the tube enters the œsophagus the choking usually stops. Supposing the case to be one in which the removal of something hurtful from the stomach is the object of the operation, after the tube has been passed, not less than half-a-pint of warm water, or of some special fluid, must be injected into the stomach before anything is sucked from it. The stomach may then safely be emptied, and the process of injection and suction repeated until the object is attained. In cases of irritant poisoning, a stomach tube made of india-rubber should be used.

In cases of poisoning, a pint of water, or of some bland, soothing fluid should be left in the stomach; as also in the case of simple drunkenness, unless it be desired to leave an emetic injection instead. If, however, the pump has been employed for the purpose of washing the mucous membrane, and removing the fermenting secretions of water-brash, or similar forms of dyspepsia, only that amount of fluid should be left behind which the pump will not readily remove.

But the mechanism of a syringe with its taps and valves may be readily dispensed with, and the stomach

may be washed out on the syphon principle very easily indeed. All that is required is the tube of the stomach pump, an india-rubber tube capable of being attached to this, and a funnel. The stomach tube having been passed, the tube and funnel are joined on, and then by alternately pouring in fluid (the funnel being held about 2ft. 6in. above the level of the stomach) and then removing it by lowering the tube to an equal distance below, the operation of washing out the stomach can be reduced to its simplest conditions.

Of the Hypodermic syringe.

There are a number of patterns of hypodermic syringes, but their varieties involve no real difference of principle. They all are graduated to deliver the fluid to be injected by measured drops, and it matters little if this be effected by a screw, or a thrust piston. Fig. 90 is an illustration of a good form of the instrument.

FIG. 90.—*Syringe for Hypodermic Injection.*

In Fig. 91 we have shown the manner of inserting the hypodermic needle. The special points to be observed are:—

(1) That the needle should be thrust into the subcutaneous tissue at some place where it is loose and where the skin is free from veins.

(2) The fluid having been injected, the needle should be withdrawn quickly, and then, the puncture being *covered by the* point of the finger, the injected fluid *should be dispersed* into the tissues by gentle rubbing.

(3) Scrupulous attention must be paid to cleanliness.

Those forms of syringe should be used which can be readily sterilized. The skin of the patient should be cleansed at the site of injection. Care should be taken that the solutions used are recent and are made of sterilized water, and that the needle is boiled before use. Special attention must be paid to the needle after it has been used for injecting patients suffering from such infectious disease as erysipelas, anthrax, etc. Numerous deaths have been recorded through inattention to this point, disease being conveyed from one patient to another by the dirty hypodermic syringe.

(4) Lastly, and this point we would most strongly insist upon, no surgeon, house-surgeon, or dresser, should ever be induced to instruct a patient, or any one of the laity, in the art of self-injection. A syringe and a bottle of morphia are tools far too unsafe, and

FIG. 91.—*Method of Hypodermic Injection.*

far too seductive, to leave in hands where they may be tampered with, and used, it may be unwittingly, as *agents for self*-destruction.

CHAPTER XII.

Of Surgical Case Taking.

The art of taking notes of surgical cases well, is one not easily acquired, and for the notes to be of much value, something more than vague general notions upon surgical subjects must be pre-supposed. Yet in many hospitals, dressers who are beginning their work in the surgical wards, or clinical clerks in the medical ones, are expected to be able to write intelligible histories of cases which are themselves, very possibly, obscure to the last degree; and further, to write these so that their account shall stand for all time as being full, true, and particular, so that those who may, on some future occasion, require to look up the case books of the hospital, will find therein a trustworthy account of whatever case, or group of cases, may be under investigation.

Notes which will perfectly fulfil these conditions can hardly be expected, and will only exceptionally be obtained from dressers, at any rate during the first few months of their ward work; but nevertheless there is hardly any other part of a dresser's work which will be so useful to him educationally, as his case taking. *Litera scripta manet*, and he will find that every case which he intelligently records (and therefore studies, because he *has* to record) will remain with him a lifelong experience.

What he must aim at in his case taking must be, first and foremost, *absolute truth*, and it will be found that sometimes there is a strong temptation to make the facts square with a preconceived theory; and *secondly, to present* a clear story of the case, without *introducing any* personal opinions, letting the facts *tell their own tale*.

The notes of a case, then, should comprise :—

(1.) A description of the patient, and of the symptoms, objective and subjective, presented by him (or her) when he first comes under the notice of whomsoever has to record the case.

(2.) An account of those facts of his previous life history, and in his family history, which may throw light upon his present condition, and the sources of this information.

(3.) The previous story of the illness derived from the patient himself, his parents, or from other people, the source being, in all cases, stated.

(4.) A *diary* recording the measures, operative and other, which are adopted for the relief of his complaint, after he has come under observation, and the subsequent course of events.

(5.) The *result* of such treatment, namely, cured, relieved, unrelieved, or died, and in the last event—

(6.) Whether or no a *post mortem* examination was made, and if so, an account of the results of this examination.

The following scheme will be found a generally convenient and workable plan for recording cases upon the lines we have here laid down.

Ward. Name.	Sex.	Age.	No. of Register. Occupation.	Date of Admission Residence.	Date of Discharge.	Result— Cured Relieved Unrelieved Died.
By whom taken.			Name of Surgeon.		Date of taking case.	
The patient's family history, *i.e.,* (*a*) If the parents are alive ; or dead if the latter, at what ages, and how. (*b*) Brothers and sisters, No. of, whether alive or dead, etc. (*c*) Place of Patient in his family. (*d*) Results of enquiries about hereditary tendencies, as to gout, insanity, cancer, etc.						

The patient's previous history.
including (*a*) previous illness.
(*b*) habits of life (state source of information).
(*c*) other facts bearing on this part of the case.

History of the present illness, from its commencement up to the date of taking the case, as derived from the patient, or from his friends or relatives (state the source given in as nearly as possible the words actually used by them.

The patient's condition at the time of taking the case.

(*a*) General description. Position of patient in bed. State of nutrition, local and general. Indications of a diathesis (*i.e.*, strumous, syphilitic, etc.) The condition of the organs of circulation, respiration and digestion. The condition of the skin and of the glands. The temperature (noting time when taken). The appearance, sp. gr., and quantity of urine passed, and whether albumen is present or no. The condition of the organs of motion and locomotion. Sleep, its amount and character of.

(*b*) Description of actual seat of disease, its locality, its *objective* physical appearances, and the *subjective* abnormal sensations connected with it.

(*c*) Other noteworthy local abnormalities.

The "case" being thus taken, it will be the duty of the dresser, or of whomsoever is appointed to continue the record, to preserve a consecutive account of the course of events from the moment the patient comes under treatment.

If an operation be performed, it must be fully described, especial attention being paid to the following points:—

The actual incisions and manipulation. The approximate amount of blood lost, and the condition of the patient at the close of operation. The number and method of insertion of sutures (if any used). The position of the drainage tubes. The plan of dressing the wound, the position of the patient subsequently in *bed, and* the nature of the anæsthetic.

If the operation be of the nature of a *removal*, either *of a growth or of a limb*, the notes must always *describe fully the parts* taken away. For example, it

the thigh be amputated in its lower third, for disease of the knee, the details of the condition of the joint, and its ligaments, the muscles, etc., in its neighbourhood, the cartilages and the bones, must all be fully pictured. Were the case one of an epithelioma of the lip, in addition to the naked eye appearances of the growth, its microscopic structure should also be given.

As the case goes on, it will probably be found unnecessary to make daily entries on the case paper, but however chronic the disease in question may be, and however slow the convalescence, it will be found convenient to make some note of the patient's condition, at the very least once, and as a rule twice, in the week, upon the occasion of the surgeon going his rounds.

The patient's temperature is now commonly taken, night and morning, by a ward nurse, and entered upon a chart, appended to the case book. This plan is a good one in many ways, inasmuch as the observations are made at every 12 hours, and at the most suitable times, but it involves a certain risk that this condition of the patient may be overlooked by the dresser. It should therefore be a rule that the temperature readings should be entered in the notes, as well as placed upon the chart, in all serious cases.

When the notes record a patient's discharge, the extent of recovery should always be noted, and in the case of death, the actual cause should be carefully stated, if it be apparent; in those cases where a *post mortem* examination is made the results must be fully recorded, and the dresser should be especially careful not to lose this opportunity of clearing up obscurities, and verifying and correcting opinions formed during the patient's lifetime.

INDEX.

3710.95 J. Wright & Co., Printers, Bristol.

JOHN WRIGHT & CO.'S PUBLICATIONS, BRISTOL.

Fourteenth Year, 8vo, Cloth, 927 pp. 7/6 *net, post free.*

The Medical Annual, 1896: A Complete Work of Reference for Medical Practitioners, including 20 full-page Plates (8 coloured) and numerous Illustrations. Combines the features of an Annual Retrospect with those of a Medical Encyclopædia. Each volume contains *entirely new matter.*

Large 8vo. Strongly bound. 21/-, *net.*

A Text Book of Histology: Descriptive and Practical. With 174 Beautifully Coloured Original Plates, and other Illustrations. By ARTHUR CLARKSON, M.B., C.M. Edin., form. Demons. of Phys. in Owens Coll., Manch.; late Demons. of Phys., Yorkshire Coll., Leeds.

8vo. 10/6, *net, post free. Illustrated.*

The Surgery of the Chest: For Students and Practitioners. By STEPHEN PAGET, M.A. Oxon, F.R.C.S., Surg. to West Lond. Hosp. and to the Metrop. Hosp.

8vo. Cloth, Bevelled Boards. 10/6 *net, post free.*

Leprosy: In its Clinical and Pathological Aspects. Illustrated by numerous Photographs and Coloured Plates. By DR. G. ARMAUER HANSEN, Inspector General of Leprosy in Norway; and Dr. CARL LOOFT, formerly Assistant Physician to the Lungegaards Hospital. Translated by NORMAN WALKER, M.D., F.R.C.P. Edinburgh.

Post 8vo. Illustrated, and with Coloured Plates, 8/6, *post free.*

Diseases of the Upper Respiratory Tract: The Nose, Pharynx, and Larynx. By P. WATSON WILLIAMS, M.D. London; Phys. Throat Dept. Bristol Roy. Infirm.; Hon. Phys. Deaf and Dumb Inst.

Second Edition. 8vo. Cloth. Illustrated. 4/- *net, post free.*

OTHERS IN PREPARATION.

Urinary Surgery: For Students and Practitioners. By E. HURRY FENWICK, F.R.C.S., Surg. to the London Hosp.; Surg. and Path. to St. Peter's Hosp. for Urinary Diseases.

4th Ed., Revised. Waistcoat Pocket Size. Paper Covers, 1/-, *post free.*

Fenwick's Golden Rules of Surgical Practice: For the use of Dressers and Junior House Surgeons. By E. HURRY FENWICK, F.R.C.S., Surgeon to the London Hospital and St. Peter's Hospital for Urinary Diseases.

BRISTOL: J. WRIGHT & CO. LONDON: SIMPKIN & CO., LD.

JOHN WRIGHT & CO.'S PUBLICATIONS, BRISTOL.

Third Edition. 10/6, *post free.* *Illustrated with* 235 *Engravings.*

Pye's Surgical Handicraft: A Manual of Surgical Manipulations, Minor Surgery, etc. For the use of General Practitioners, House Surgeons, Students and General Dressers. By WALTER PYE, F.R.C.S., Surg. St. Mary's Hosp. and Vict. Children's Hosp. Revised and Edited by T. H. R. CROWLE, F.R.C.S., Surg. Regis. St. Mary's Hosp., and Surg. Tutor and Joint Lect. on Practical Surgery in the Medical School. With special chapters on Aural Surgery, Teeth Extraction, Anæsthetics, etc., by Messrs. FIELD, HOWARD HAYWARD and MILLS.

Cheaper Edition. *Large* 8*vo.* *Cloth,* 4/6, *post free.* 80 *Illustrations.*

Pye's Surgical Treatment of Children's Deformities. By WALTER PYE, F.R.C.S., Author of *Surgical Handicraft.*

2/-, *post free.* *6th Edition.* *Pocket Size.* *Cloth.* *Upwards of* 80 *Illustrations.* *Adopted by the St. John Ambulance Association.*

Pye's Elementary Bandaging and Surgical Dressing: With Directions concerning the Immediate Treatment of Cases of Emergency. Mostly condensed from *Pye's Surgical Handicraft.* By WALTER PYE, F.R.C.S.

Demy 8*vo.* *Illustrated.* 6/6, *post free.*

Saundby's Lectures on Bright's Disease: Illustrated with 50 Wood Engravings. By ROBERT SAUNDBY, M.D. Edin., F.R.C.P. Lond., Professor of Medicine in Mason's College, Birmingham; Physician to General Hospital, Birmingham.

Demy 8*vo,* *Cloth, with Illustrations.* 7/6, *post free.*

Saundby's Lectures on Diabetes: Including the Bradshawe Lecture, delivered before the Royal College of Physicians in 1890. By the same Author.

8*vo,* *Cloth, with Numerous Plates and Illustrations.* 7/6 *net, post free.*

Rheumatoid Arthritis: Its Pathology, Morbid Anatomy, and Treatment. By GILBERT A. BANNATYNE, M.D., M.R.C.P., Hon. Physician to the Royal United Hospital and to the Royal Mineral Water Hospital, Bath.

Small 4*to.* *Cloth Lettered.* 2/6, *post free.*

Rheumatism: Some Investigations respecting its Cause, Treatment, and Cure. By PERCY WILDE, M.D.

Second Edition. *Large* 8*vo.* *Reprint.* *Illustrated.* 6/-, *post free.*

The Practice of Hypnotic Suggestion: An Elementary *Handbook for* the use of the Medical Profession. By GEORGE C. KINGSBURY, M.A., M.D. (University of Dublin).

BRISTOL: J. WRIGHT & Co. LONDON: SIMPKIN & Co., Ld.

JOHN WRIGHT & CO 'S PUBLICATIONS, BRISTOL.

Second Edition. 69 *Illustrations, Cloth,* 8vo. 4/6, *post free.*

Ophthalmological Prisms and the Decentering of Lenses: A Practical Guide to the Uses, Numeration, and Construction of Prisms and Prismatic Combinations, and the Centering of Spectacle Lenses. By ERNEST E. MADDOX, M.D., Ophth. Surg., New Town Disp., late Syme Surg. Fellow, Edin.

Demy 8vo. *Bevelled Boards, Illustrated.* 2/6, *post free.*

Eye-sight and School Life. By SIMEON SNELL, F.R.C.S., ED., &c. Ophthalmic Surg., Gen. Infirm., Sheffield.

Large 8vo. *Bevelled Boards. Illustrated.* 6/-, *post free.*

Miner's Nystagmus: and its Relation to Position at Work and the Manner of Illumination. BY SIMEON SNELL, F.R.C.S., Ophthalm. Surg., Sheffield Infirm.

Crown 8vo, *Cloth. Illustrated.* 2/6, *post free.*

Notes on Nursing in Eye Diseases: Illustrated with Wood Engravings and Process Blocks. BY C. S. JEAFFRESON, M.D., F.R.C.S.E., Senior Surgeon Northumberland, Durham and Newcastle Infirmary for Diseases of the Eye.

Large 8vo. *Cloth, Bevelled Boards.* 6/6, *post free.*

The Eye in its Relation to Health: BY CHALMER PRENTICE, M.D., Chicago.

Large 8vo, *Cloth.* 6/-, *post free.*

Epitome of Mental Diseases: With the Present Methods of Certification of the Insane, and the Existing Regulations as to "Single Patients." A Book of Reference for Practitioners and Students, Alphabetically arranged. By JAMES SHAW, M.D., formerly Medical Superintendent and Co-Licensee Haydock Lodge Asylum.

Imperial 16mo. *Cloth,* 3/6, *post free.*

Ptomaines and other Animal Alkaloids: Their Detection, Separation, and Clinical Features. By A. C. FARQUHARSON, M.D., D.P.H. Cantab.

Crown 8vo, *Cloth.* 2/6, *post free. Second Edition, Enlarged.*

The Workhouse and its Medical Officer: By ALFRED SHEEN, M.D., M.R.C.S., Senior Surgeon Glamorgan and Monmouthshire Infirmary, Cardiff.

Pocket Size, Limp Covers, 2/-, *post free. With numerous Illustrations.*

Primer of the Art of Massage (for Learners). By THOMAS STRETCH DOWSE, M.D.

BRISTOL: J. WRIGHT & CO. LONDON: SIMPKIN & CO., LD.

JOHN WRIGHT & CO.'S PUBLICATIONS, BRISTOL.

Fourth Edition. Cloth, 2/6 post free.

A Skin Pharmacopœia: Containing Formulæ, Ointments and Lotions, Baths, Rules of Diet, Classification, and Therapeutical Index. By JAMES STARTIN, Senior Surgeon to the London Skin Hospital, Fitzroy Square.

Fourth Ed. Revised. 8vo, Thick Paper, 1/6; or Cloth, 2/6, post free.

MAY BE SAFELY RECOMMENDED.

Our Baby: A Book for Mothers and Nurses. By MRS. LANGTON HEWER, Diplomée Obstetrical Society, London; late Hospital Sister. Author of *Antiseptic Nursing*.

Large 8vo, about 400 pages. 6/-, post free.

Disease of Inebriety: From Alcohol, Opium, and other Narcotic Drugs. Its Etiology, Pathology, Treatment, and Medico-Legal Relations. By the American Association for the Study and Cure of Inebriety.

Demy 8vo, with Plate. 4/6 net, post free.

Angio-Neurosis: Being Studies in Diseases of the Vaso-Motor System. By W. RAMSAY SMITH, M.B., C.M., B.Sc., Sen. Phys., Adelaide Hosp., South Australia; late Exam. Roy. Coll. Phys., Edin.

Large 8vo, with two Coloured and other Illustrations. 3/6, post free.

Myxœdema, Cretinism and the Goitres. By EDWARD T. BLAKE, M.D., M.R.C.S.

Crown 8vo. Cloth, 5/-, post free.

Herbal Simples Approved for Modern Uses of Cure. Supplied from the Garden, the Field, the Hedge-row and the Store Closet. By W. T. FERNIE, M.D., M.R.C.S., Author of *Botanical Gossip, etc., etc.* Not a few are shown to act according to the law of Similars: how to gather the Herbs in the fields, or from what sources to get them at home, is fully taught.

Fourth Edition. 1/-, post free. Enlarged and Illustrated.

Baths and Bathing. By JOSEPH FARRAR, M.D.

Crown 8vo. 1/-, post free.

The Water Cure in the Bedroom; Or Hydropathy at Home. By G. H. DOUDNEY, M.B., M.R.C.S. Eng.

Long 8vo. Stiff Covers, Flush. 1/6, post free.

***Maladies of Old* Age and their Treatment.** By G. H. DOUDNEY, M.B., M.R.C.S. Eng.

BRISTOL: J. WRIGHT & CO. LONDON: SIMPKIN & Co., Ld.

JOHN WRIGHT & CO.'S PUBLICATIONS, BRISTOL.

5/6, *post free. In Leather, Gilt Edges. Complete with Pencil Case. Two Pockets, Flap, and Fastener.*

Copies sent on Approval on receipt of 3d. for postage.

Wright's Improved Visiting Lists, only require writing once a month. Compiled by ROBERT SIMPSON, L.R.C.P., L.R.C.S.

The Lists are also published **in the Perpetual Form,** at the same price, and may be commenced at any time.

The dates are printed at the bottom as well as top of the pages, and spaces for visits are ruled alternately red and blue for greater clearness in carrying the eye across the pages.

CONTENTS: List for 160 Patients—Consultants' Record—Cash Column and Journal on every page—Cash Accounts after Each Month—Obstetric Engagements—Vaccination Engagements—Notifications of Infectious Diseases—Addresses of Nurses, Patients, and others—Journal and Memoranda—Dose Index—Combined Almanac and Utero-Gestation Table, with much General Information.

Wright's Prescription Books. Single or Duplicate. Gold Stamped, Round Corners, Gilt Edges, Printed and Perforated.

No.	*(In ordering, please quote the number.)*	EACH.	DOZ.
12.—	150 Prescription Forms in Book, each to tear out, 4 in. × 6½ in.	1s.	10s.
13.—	100 Ditto in Book, with Duplicate on Copying Paper ..	1s.	10s.
14.—	75 Ditto, Waistcoat Pocket size, 2½ in. × 4¼ in.	6d.	5s.

If preferred, these can be made sewn at the side instead of the head; or Nos. 12 *and* 13 *printed with own name, address, and hours of attendance, for* 12/- *per doz. Other sizes on application.*

One Hundred and Twenty-eighth Thousand. Samples free.

Wright's Pocket Charts, for Bedside Case Taking. Compiled by ROBERT SIMPSON, L.R.C.P., L.R.C.S. These Charts provide a method of recording important cases without loss of time and with little trouble. Will fit the pockets of **Wright's Improved Visiting List.**

(In ordering, please quote the number.)

No. 1.—	50 CHARTS, folded for Pocket Case	post free 2/-
„ 2.—	50 Ditto, on Cards, Eyeletted Flat	„ „ 6/-
„ 3.—	1 POCKET CASE, Limp Roan, to hold 50 Charts, complete with Pencil	„ „ 2/6
„ 4.—	1 GUARD BOOK, Half Bound, Gold Lettered, to hold 200 Complete Charts	„ „ 6/-
„ 5.—	60 CHARTS, 1 GUARD BOOK, and 1 POCKET CASE, complete	„ „ 10/-

BRISTOL: J. WRIGHT & CO. LONDON: SIMPKIN & CO., LTD.

JOHN WRIGHT & CO.'S PUBLICATIONS, BRISTOL.

Temperature and Diet Charts, with Clinical Diagrams, specially arranged for Hospital use. Designed by Edgar Simpson, L.R.C.P., L.R.C.S. Contain on the front an improved *Temperature Chart for four weeks*, a *Diet Chart*, *Instructions to Nurses*, etc., and at back two full-length *Clinical Figures*, including Outlines and Skeleton (front and back), with Viscera printed in red ink, and outlines of Head. *Samples free.*

(In ordering, please quote the number.)

	Per 1000	500	250	100	50
No. 7.—CHARTS, complete, with Figures on back in two colours	35/-	20/-	11/-	5/-	3/-
„ 8.—Ditto, without Figures, one side only	22/-	12/6	7/-	3/-	2/-
„ 9.—Clinical Figures only, two colours	25/-	15/-	8/-	3/6	2/6
„ 22.—Temperature Charts only, for four weeks	20/-	11/-	6/-	2/6	1/6
„ 23.—Temperature Charts, with Nurses' Instructions and Notes	22/-	12/6	7/-	3/-	2/-

Wright's Improved Chart Holders, with Imperishable Nickel-plated Corners and Eyelets. For Hospital use and private practice.

Samples to Hospitals free on Application.

Prices for quantities	from 1/- each
Single Holders	„ 1/6 „

Medical Account Books.

(In ordering, please quote the number.)

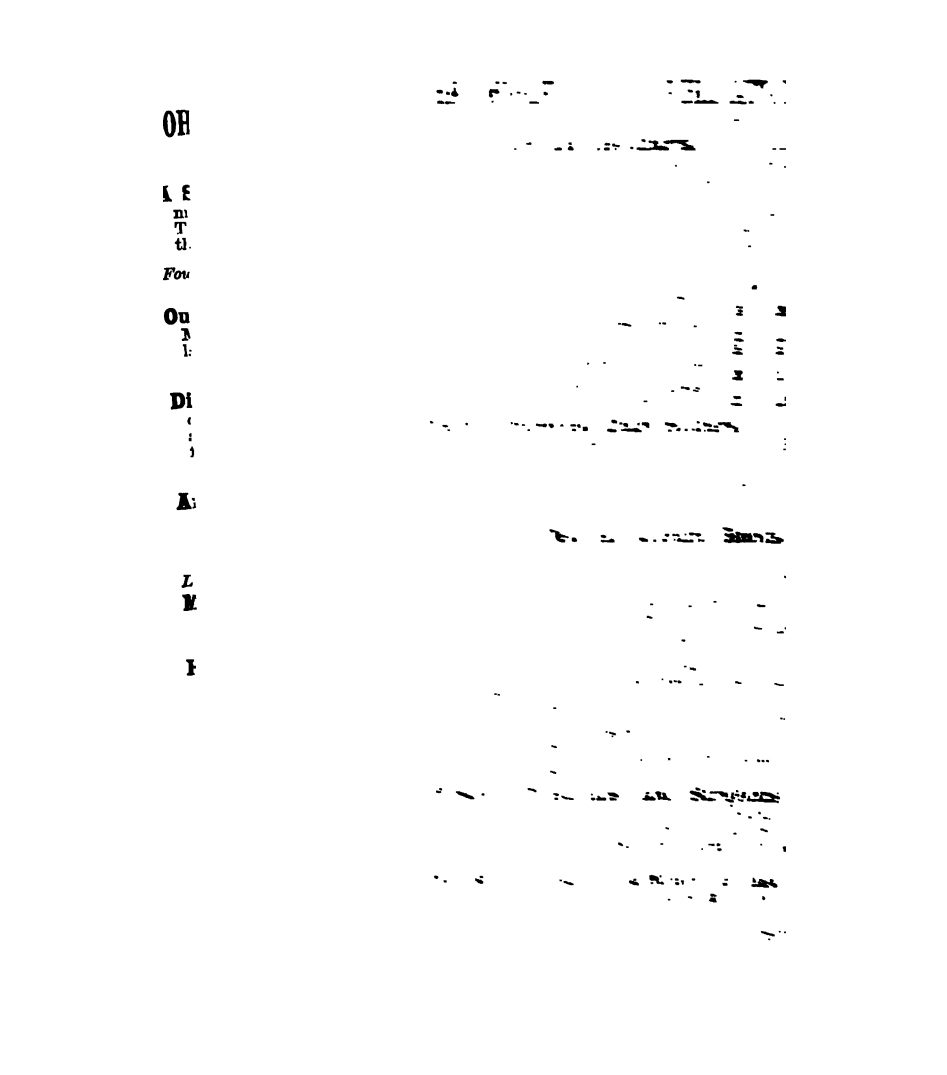
No. 10.—ITEM PAPERS, 8 in. × 7 in.	per 500, 5/-; 1000, 8/-
„ 11.— 4 in. × 7 in.	5/6 9/-
„ 15.—CASH BOOKS, 9½ in. × 6 in., strongly half bound, printed headings and paged, 250 pages, ruled with double columns, by which *Professional* and *Private* income and expenditure can be separately kept in one book	7/-
„ 16.—Ditto, 500 pages	9/-
„ 17.—DAY BOOKS, 12½ in. × 8 in., 250 pages, ruled for 31 days and cash column, printed headings, strongly half bound, paged	11/-
„ 18.—Ditto, 500 pages	15/-
„ 19.—DAY BOOKS, 12½ in. × 6 in., ordinary ruling, paged, strongly half bound, 250 pages	6/-
„ 20.—Ditto, 500 pages	8/-
„ 21.—LEDGERS, 12½ in. × 8 in., strongly half bound, 250 pages	10/-
„ 24.—Ditto, 500 pages	14/-

Jefferson's Physicians' and Surgeons' Register. A New System of Account Keeping, comprising everything needed in one volume. Though several imitations have been issued since its introduction in 1891, this form of book-keeping is still probably the best of its kind.

***One Book* is usually sufficient to last Four Years.**

PRICES: Registering 2,600 Accounts, 20/-; 5,200 Accounts, 52/6.

BRISTOL: J. WRIGHT & CO. LONDON: SIMPKIN & CO., LD.



JOH

A f

Fo

Ou

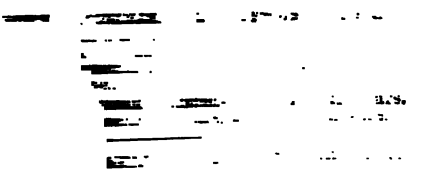
Di

A

I.
N

I

E



JOHN WRIGHT & CO.'S PUBLICATIONS, BRISTOL.

Temperature and Diet Charts, with Clinical Diagrams, specially arranged for Hospital use. Designed by ROBERT SIMPSON, L.R.C.P., L.R.C.S. Contain on the front an improved *Temperature Chart for four weeks*, a *Diet Chart*, *Instructions to Nurses*, etc., and at back two full-length *Clinical Figures*, including Outlines and Skeleton (front and back), with Viscera printed in red ink, and outlines of Head. *Samples free.*

(In ordering, please quote the number.)

	Per 1000	500	250	100	50
No. 7.—CHARTS, complete, with Figures on back in two colours	36/-	20/-	11/-	5/-	3/-
„ 8.—Ditto, without Figures, one side only	22/-	12/6	7/-	3/-	2/-
„ 9.—Clinical Figures only, two colours	26/-	15/-	8/-	3/6	2/6
„ 22.—Temperature Charts only, for four weeks	20/-	11/-	6/-	2/6	1/6
„ 23.—Temperature Charts, with Nurses' Instructions and Notes	22/-	12/6	7/-	3/-	2/-

Wright's Improved Chart Holders, with Imperishable Nickel-plated Corners and Eyelets. For Hospital use and private practice.

Samples to Hospitals free on Application.

Prices for quantities .. .. from 1/- each.
Single Holders .. .. „ 1/6 „

Medical Account Books.

(In ordering, please quote the number.)

No. 10.—ITEM PAPERS, 8 in. × 7 in... .. .. .. per 500, 5/-; 1000, 8/-
„ 11.— „ 4 in. × 7 in... .. .. 5/6; .. 9/-
„ 15.—CASH BOOKS, 9½ in. × 6 in., strongly half bound, printed headings and paged, 250 pages, ruled with double columns, by which *Professional* and *Private* income and expenditure can be separately kept in one book 7/-
„ 16.—Ditto, 500 pages 9/-
„ 17.—DAY BOOKS, 12½ in. × 8 in., 250 pages, ruled for 31 days and cash column, printed headings, strongly half bound, paged.. .. .. 11/-
„ 18.—Ditto, 500 pages 15/-
„ 19.—DAY BOOKS, 12½ in. × 6 in., ordinary ruling, paged, strongly half bound, 250 pages 6/-
„ 20.—Ditto, 500 pages 8/-
„ 21.—LEDGERS, 12½ in. × 8 in., strongly half bound, 250 pages .. 10/-
„ 6A.—Ditto, 500 pages 14/-

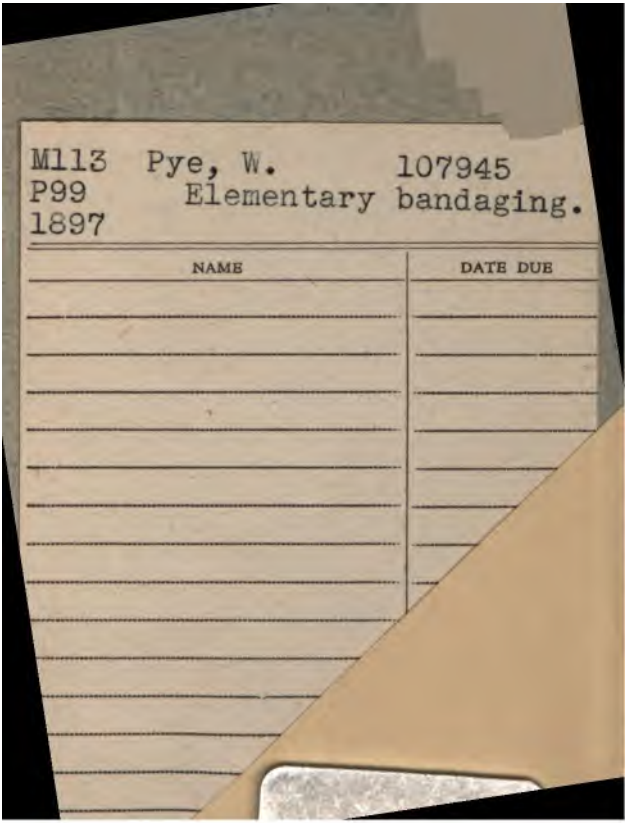
Jefferson's Physicians' and Surgeons' Register. A New System of Account Keeping, comprising everything needed in one volume. Though several imitations have been issued since its introduction in 1891, this form of book-keeping is still probably the best of its kind.

One Book is usually sufficient to last Four Years.

PRICES: Registering 2,600 Accounts, 30/-; 5,200 Accounts, 52/6.

LANE MEDICAL LIBRARY

This book should be returned on or before
the date last stamped below.


M113 Pye, W. 107945
P99 Elementary bandaging.
1897
NAME
DATE DUE